PIERCE-ARROW

TWO-TON TRUCK

SPECIFICATIONS

THE
PIERCE-ARROW MOTOR CAR CO
BUFFALO N.Y.

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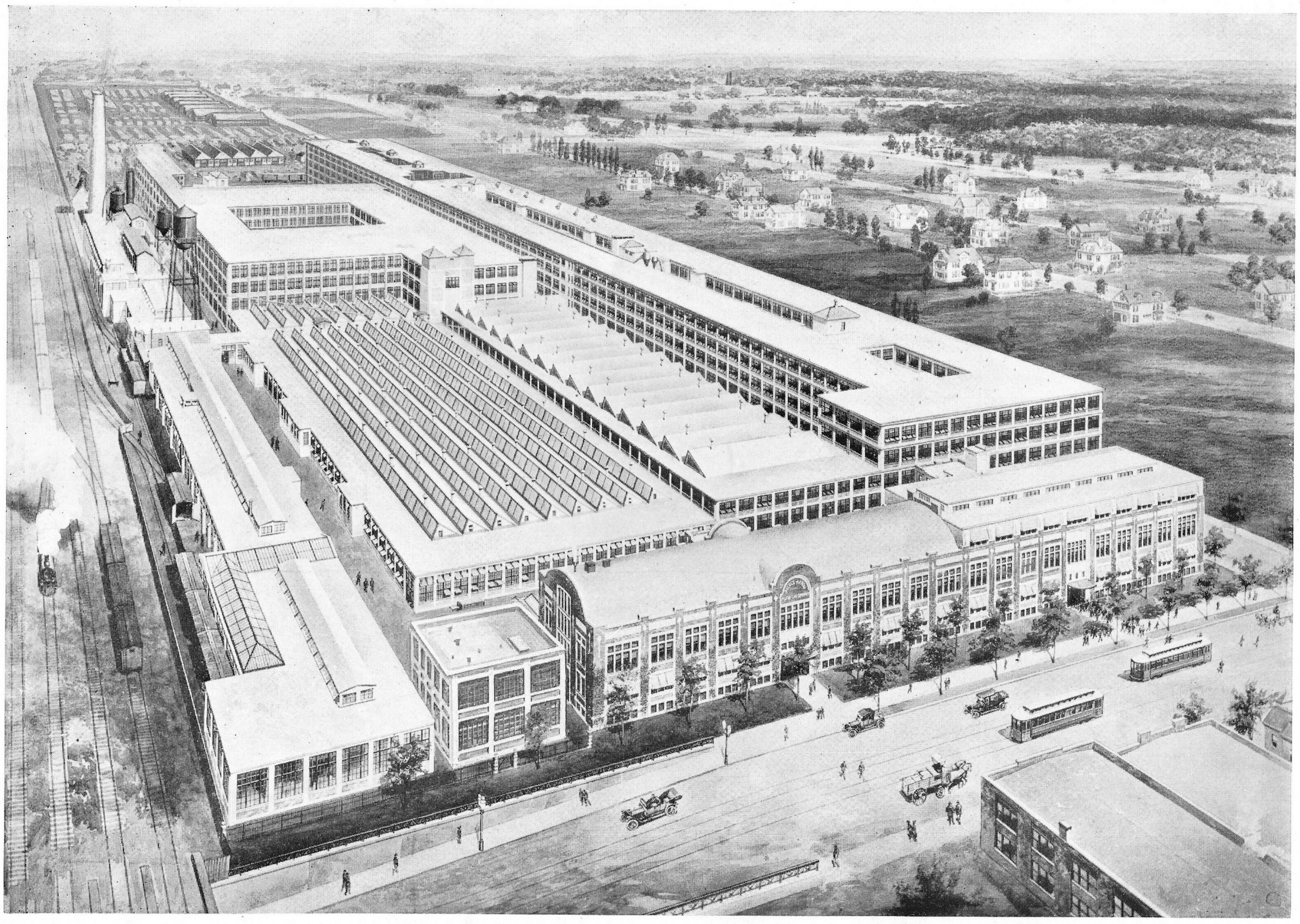


FACTORY OF THE PIERCE-ARROW MOTOR CAR COMPANY, BUFFALO, N. Y.

Foreword

THREE important factors effect the desirability of a truck investment:

THE COMPANY making the truck.
THE TRUCK itself.
THE SERVICE given the purchaser
by the manufacturing company.

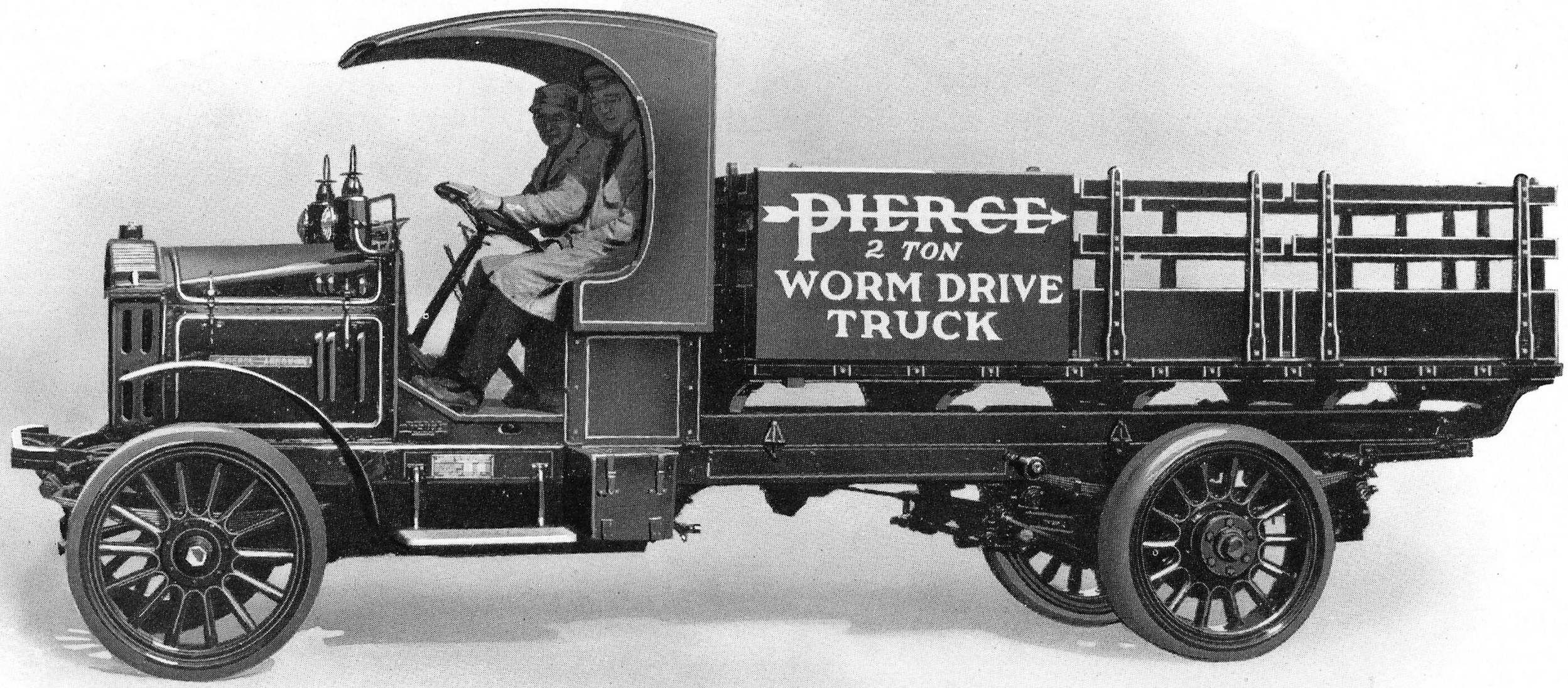
If the company is not substantial, reliable and conservative, financially sound and permanent, its warranty is worthless.

If the truck is not well designed and well built, if it is not the result of long and careful experiment and test, there can be no certainty in regard to its performance.

If the service extended to the purchaser is not willingly given, prompt and capable, it will tremendously handicap him in working the truck at its maximum capacity.

We believe that the Pierce-Arrow Motor Car Company, its product and its service will support the most searching analysis.

Reputations are not made over night, nor is experience entirely gained in experimental laboratories or by means of tests conducted by engineers. Whether a truck will give satisfactory results to the user can be determined only by service covering a long series of years. The Pierce-Arrow worm-driven truck has been on the market and in the hands of the user since June, 1911, and during that time the weaknesses have been eliminated by the process of actual time in experience.



PIERCE-ARROW 2-TON TRUCK

The Company and the Product

THE Pierce-Arrow Motor Car Company builds nothing but motor trucks and motor cars. It is not interested, directly or indirectly, in any other manufacturing enterprise. Its whole surplus is available to substantiate its credit, to back its promises, to insure its stability and to help maintain and improve the quality of its product.

The Pierce-Arrow ideal from the beginning has been to build the best possible motor trucks and pleasure cars. The Pierce-Arrow product has always been designed with the one aim of maximum excellence and efficiency. The cost of manufacturing and selling the designed product with the addition of a reasonable profit, has been the only basis for determining the selling price.

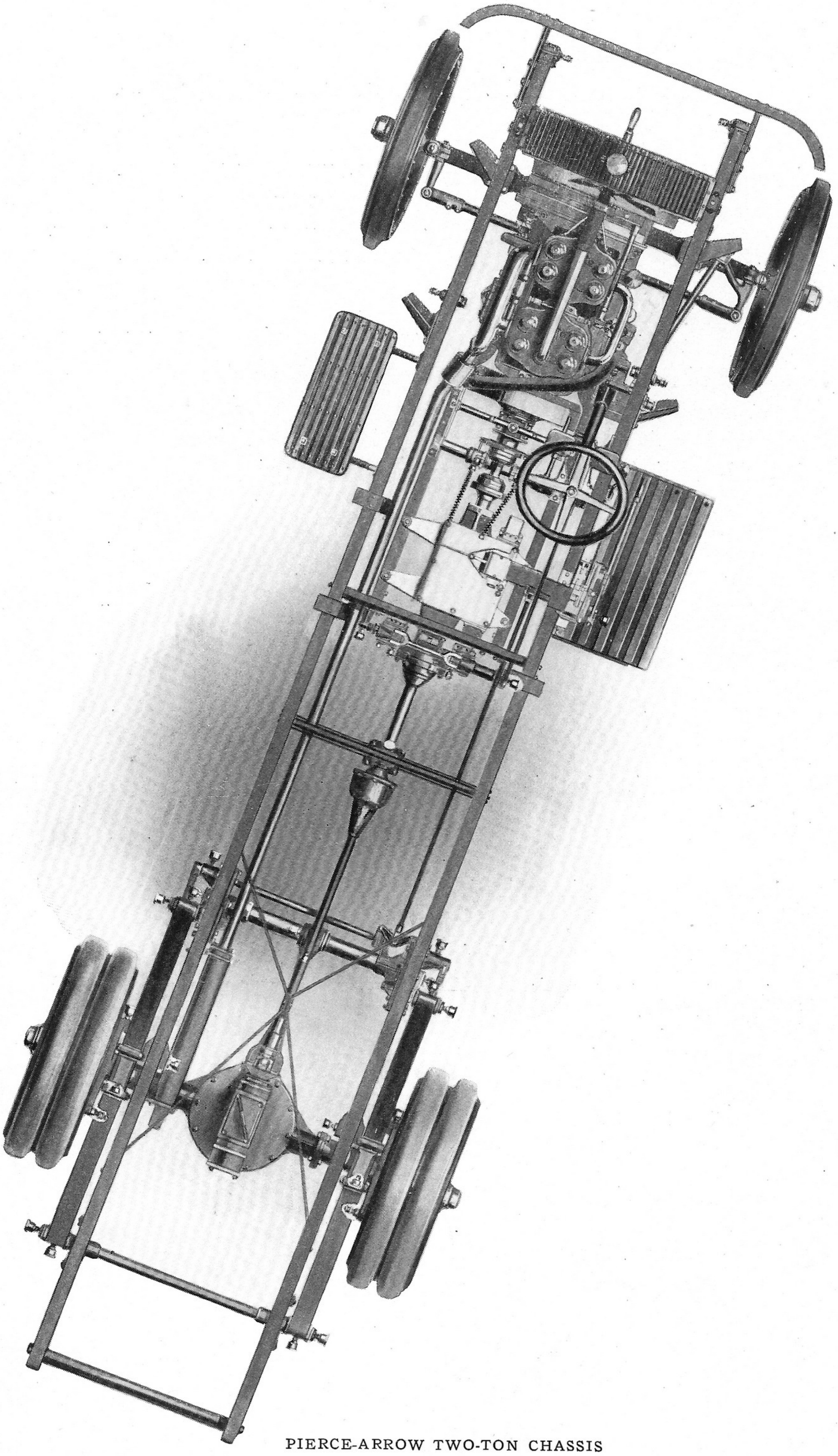
Pierce-Arrow trucks and cars are not built to a price, but to a constantly rising standard of excellence.

Only after five years of constant experiment did the Pierce-Arrow Motor Car Company begin to manufacture motor trucks. Five years of practical working experience (twelve years of constant watchfulness and concentrated effort) stand behind the present product as a guarantee of its effectiveness.

During the extensive tests of the first experimental model, the motor, transmission, clutch and front axle were found to be all that could be hoped for. The other integral parts of the chassis were good. The truck, as it stood, was a marketable vehicle, but it was not what the company believed its truck should be. It was apparent that certain radical changes in basic design were required.

These changes were made and tried out; flexible frame and three-point suspension; live load concentrated over the rear wheels with the driver's seat behind the motor; worm-drive live rear axle; these were found good and adopted.

The engineering principles involved in the use of these elements, though revolutionary, at that time, in the American motor truck field, had been well understood and successfully employed in Europe for more than a decade. It is worthy of serious note that no manufacturer of any prominence has ever abandoned any one of them after adopting it.



PIERCE-ARROW TWO-TON CHASSIS

Frame

THE flexible frame used in Pierce-Arrow trucks is a feature pioneered by the Pierce-Arrow Company, and in principle is arranged to partly conform to road inequalities.

The frame is made up of pressed channel section members of heated special alloy steel.

The cross axis of frame is located at rear end of cab by a heavy pressed-steel cross member, forming the rear support for the transmission.

The other cross members, with the exception of the large X-brace, merely serve to tie the frame channels together, but do not prevent flexing.

Sill clips of Pierce-Arrow design, with holes drilled through the side part of frame channels so as not to weaken the frame, carry oak frame sills which are supplied with all chassis as standard equipment.

The flexibility of the Pierce-Arrow frame permits of considerable weight saving, high running speed, and effects a direct saving on wheels, tires, steering gear and other component parts.

The flexibility of the frame can be demonstrated by jacking up one corner twelve inches from the ground. In this position, three wheels will still remain on the ground, and all the working parts such as motor, transmission, etc., will operate equally well (due to the system of mounting).

In going diagonally over a railroad crossing, or in the same way when the wheels pass over obstructions or depressions of considerable size, the flexible frame permits all four wheels to remain on the ground and carry their proportion of the load, thus relieving the chassis of exceptional strains and saving springs and tires from the extra burden imposed by a rigid frame construction.

The pressed steel members, while more expensive than the commonly used structural iron sections, are lighter, stronger, less subject to fatigue, of neater appearance and will greatly outlast the cheaper article.

In order to prevent lateral shifting of the frame members, the large X-brace is placed above the rear axle. This serves the purpose admirably, but does not interfere with the flexibility.

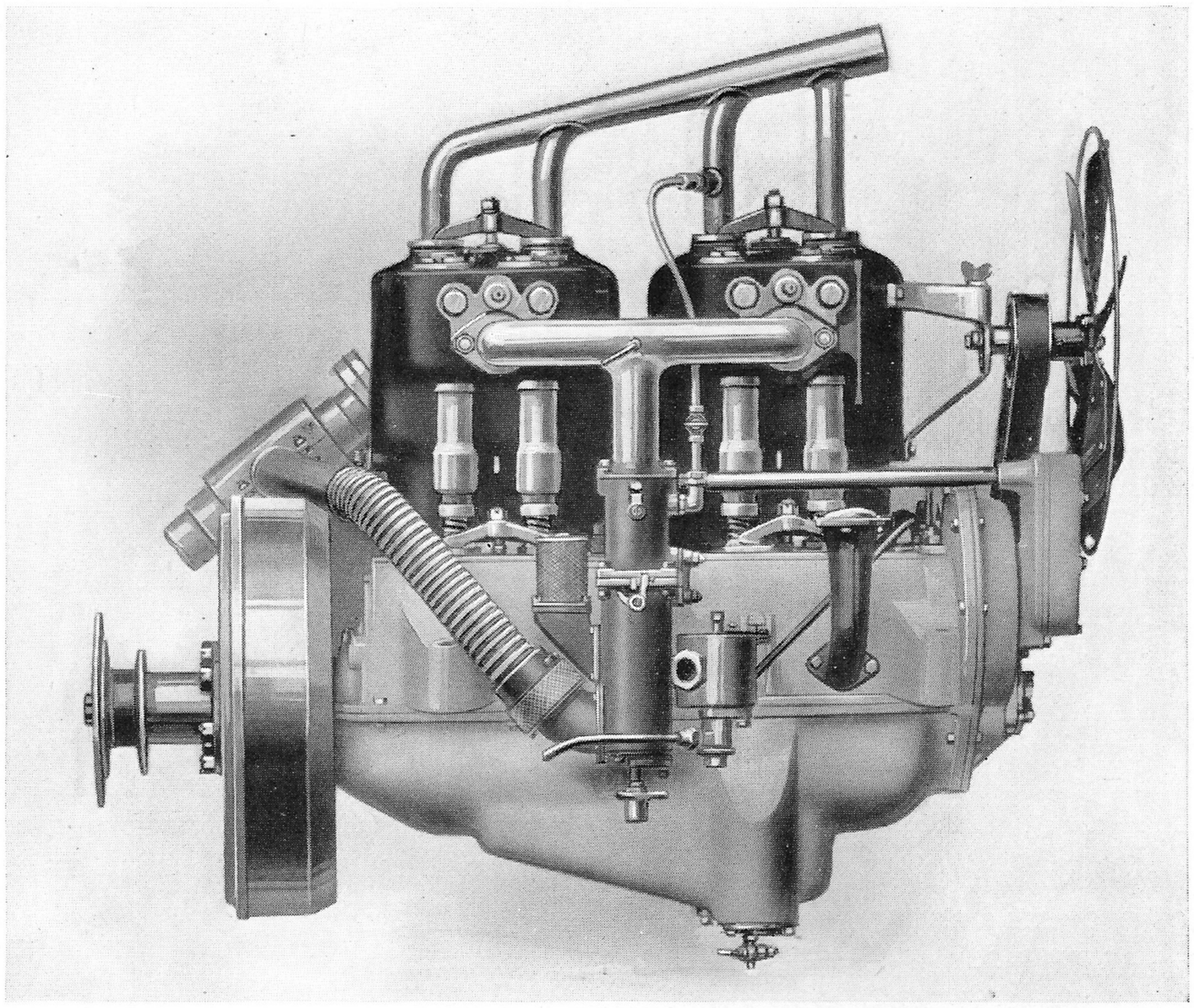
The sill clips, together with the oak sills, are jointly for the protection of ourselves and our truck owners. They are not intended to brace or strengthen the frame, but to facilitate the attaching of the body to frame, and thus obviate the necessity for drilling numerous holes in the frame members in such a way as to weaken same.

All recognized good features are sure to be copied, and the flexible frame is now coming in for this copying. However, a flexible frame improperly designed or assembled will by its very nature prove a source of trouble and expense; and for this reason the Pierce-Arrow with its pioneering of the flexible frame is in a position to offer the perfected article.

The purchaser has the option of two frame lengths—18′-1″ and 20′-7″. The short frame incorporates a wheel base of twelve feet, six inches; the long frame a wheel base of fifteen feet.

The optional frame lengths are offered to meet the varied requirements of body lengths depending on the material to be carried. The twelve feet, six inch wheel base will mount a body up to 10′-6″, and the fifteen feet wheel base will mount a body up to 13′-6″ long.

Where the wheel base is not specified, we prefer to furnish the twelve feet, six inch, as this effects a saving in weight.



INLET SIDE OF MOTOR

Motor

THE motor is of the vertical type four-cylinder T-head, 4″ x 5½″, mounted in a sub-frame. The motor is not of the so-called high speed automobile type, but a moderately slow-speed engine, governed to 1250 R.P.M.

The cylinders are cast in pairs and are allowed to age before machining. They are then subjected to a rigid inspection for flaws, and water jacket tested under pressure for leaks.

After the cylinders are sufficiently aged, they are carefully machined, then ground to a mirror-like finish and held to limits of one half of one thousandth of an inch.

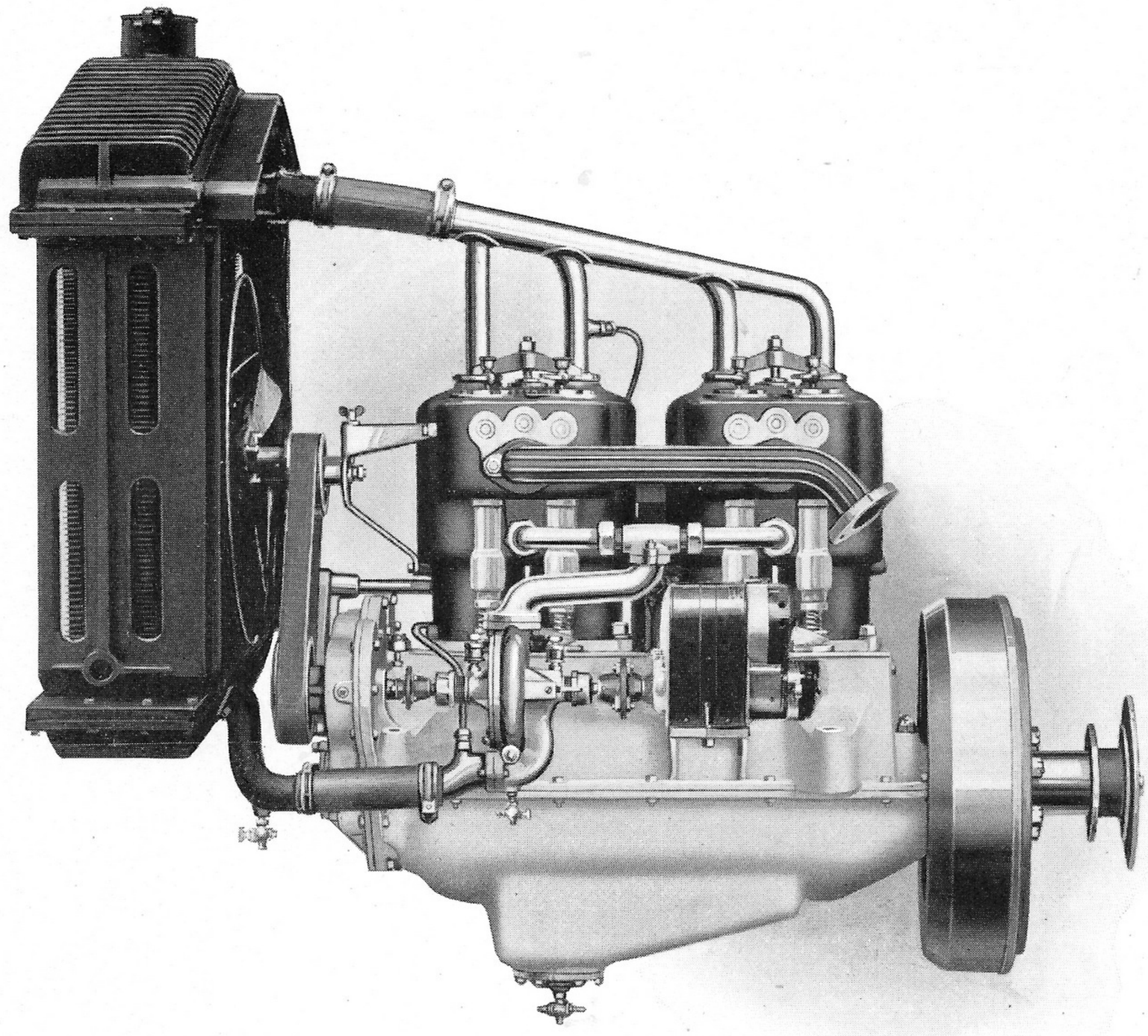
The cylinders have rounded combustion chambers and ample water space extending well down on cylinders and round the valves.

The cast aluminum alloy base is tested by the "hammer and punch" process, and is made up of two parts; the upper part carrying the cylinders, crank shaft bearings, timing gears and motor support.

The connecting rod ends are accurately machine reamed on the faces as ports; and the lower part merely serving as dust cover and oil sump.

The motor base is bolted directly to the channel members of the sub-frame. This sub-frame in turn carries the transmission and clutch operating mechanism, and is supported in the frame at three points. The crank shaft and connecting rods are heat-treated special alloy steel drop forgings. The crank shaft is of large proportions and is carried in three main bearings.

The connecting rod, crank pin and main bearings are of large dimensions, and are bushed with manganese bronze, lined with hard white babbitt. These bearings are accurately turned before the babbitt is poured and then reamed. The main crank shaft bearings are reamed by a rigid bar provided at proper intervals with reamers. This method eliminates the common inaccuracies and secures correct alignment.



EXHAUST SIDE OF MOTOR

well as the bore, thus insuring a good bearing surface and proper vertical alignment.

The pistons are fitted with special peened rings. Each ring is file-fitted to its cylinder, and hence excellent compression is obtained without the common "wearing-in" process usually resorted to. Pistons and connecting rods are carefully weighed and equalized. These precautions insure a smooth running, quiet motor with a minimum of vibration.

The flywheel is a steel forging accurately machined all over. This costs a little more than the ordinary cast iron flywheel; it is, however, absolutely safe and free from all danger of bursting; also insures uniformity in production and a smoother and more durable clutch face. The cam shafts are driven by spur gearing from the forward end of the crank shaft.

The gears are enclosed and run in an oil bath with a continuous supply from the oil tank.

The governor is of the independent throttling type. The operating mechanism is located in the inlet cam shaft gear and is of the expanding centrifugal type. The connections to the throttle valve are entirely enclosed, to keep out dirt and to prevent malicious tampering on the part of the drivers. The bolts holding the covers in place are secured with a wire and lead seal so that any tampering is immediately evident.

The governor controls the speed of the engine. In the case of the 2-ton, the maximum speed is 1250 R.P.M. geared to 16 M.P.H. The design of the manifold is such as to give a maximum power at this speed and with a minimum fuel consumption. If the governor is removed, an increase of speed naturally results; however, the tractive effort on low gear is not increased, nor can a steeper hill be ascended.

The Pierce-Arrow trucks run at higher speeds than other trucks, but we do not sanction any increase over the above figures. High speed in a truck is

of great importance as indicating the capacity of the truck; however, if the governed speed is exceeded, the operating and upkeep expenses increase out of all proportion, and it is equally as uneconomical as operating a truck at a very low speed.

There is a certain speed in the case of each make of truck which gives the greatest economy. As Pierce-Arrow trucks operate at a proportionately high rate of speed, the answer is obvious.

T-Head Motor

The T-head type of motor, such as used in Pierce-Arrow trucks, permits of large valve areas. It also gives a better balanced engine with even distribution of parts and units, which makes both sides of motor and accessories easily accessible.

In the case of the L-head motor, the valve area is cramped and everything is crowded on one side, with the result that nothing is accessible for adjustment or repairs. Again, the T-head motor permits of a uniformity of cooling on both sides of the cylinder.

Cylinders Cast in Pairs

The individual cylinder motor uses up an excessive length, while the block form—the other extreme—gives small bearing area and consequent short bearing life; also, with the intricate castings necessary, the cost of repairs is high and there is a difficulty in handling the block cylinders. Also certain troubles are encountered due to heat expansion of the cylinder blocks; this tending to set up internal stresses and throw the moving parts out of line.

Where the cylinders are cast in pairs there is a resulting ease of handling, sufficient length for ample sized bearings, compact and clean symmetrical appearance, together with the elimination of heat expansion troubles.

Valves

The valves are of one-piece Tungsten steel machined and ground all over. They do not break, warp or pit. With the efficient oiling system on Pierce-Arrow trucks, water jackets surrounding the valve chambers, regrinding of valves is necessary only at very great intervals.

Cam Shafts and Cams

The cam shafts are of soft steel ground the entire length. The cams are of soft steel with hardened faces. This is accomplished by a very ingenious process whereby the cam is first machined to shape. An electroplating of copper is then put on, which is ground off from the face of the cam. The cam is then case hardened and re-ground. In this way the face of the cam is the only part which takes the case hardening.

The cam shafts run in composition bronze bearings of large size, and these bearings are lubricated by oil sprayed from the crank pins and led by ducts to the bearings. This is a point often neglected in motor designing.

Suspension

It is known that the slightest twisting of a motor base will throw the component parts out of line, thereby binding the moving parts, with resulting injury. Three-point suspension is the logical form to permit freedom of frame members so as not to distort and strain the motor base.

The sub-frame construction on the 2-ton is a well known mounting, and is equivalent to a three-point suspension, in that the sub-frame carrying the motor and transmission is supported at three points.

Crank Case

The use of aluminum alloy for the crank case constitutes a considerable saving in weight and is sufficiently strong for the purpose. All the bearings are carried entirely in the upper half; the lower case can be removed for inspection without disturbing the bearing adjustment.

There is provision against oil splashing up from the sump by means of a sheet aluminum cover riveted in place in the lower half of the crank case.

Bearings

The construction of the main bearings and crank pin bearings is such that no

shims are used between the parts. The surfaces are hand scraped to insure a perfect fit. With the gang reaming of the crank shaft bearings and accurate reaming of connecting rod bearings, it is unnecessary to resort to "running-in" the motor.

When the motor is assembled the first time it can easily be turned by hand. This is a great departure from the out-of-date method of putting up bearings tight and belting in motor. This method never gives the smooth surface of a properly reamed bearing, and is liable to cause over-heating with resulting damage.

All pins and shafts throughout the motor are ground to a mirror-like finish and held to extremely close limits.

Pan

The dust pan is of heavy sheet steel, reinforced, and edges turned over in a round beading to give stiffness and durability. Strips of steel plate faced with a special fabric are bolted to the underneath edge of the main chassis frame. Upon this the pan is held in contact by means of eight looped spring hooks.

The method of attaching the pan to the frame is unique and is a distinctive Pierce-Arrow feature. The looped spring hooks permit of removing and replacing the pan in as few minutes as it takes to tell about it; and can be accomplished by one man. The object of the fabric facing is to give a silent connection between the pan and frame with no squeaks or rattle emanating therefrom.

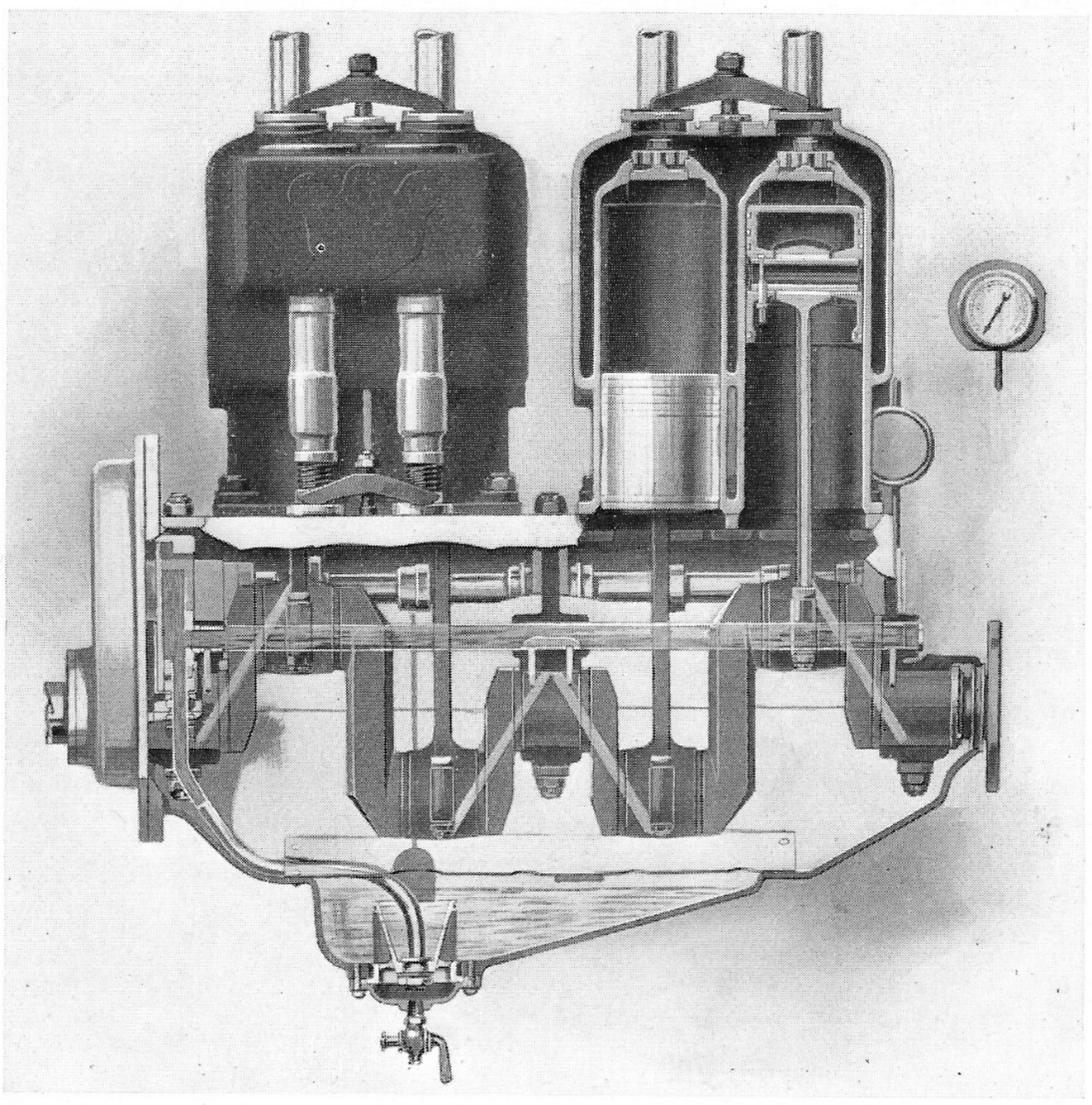
Universal Joints

On the 2-ton, an internal gear type of flexible joint is used between the motor and transmission. All of the others are of the usual Carden or Hooke type.

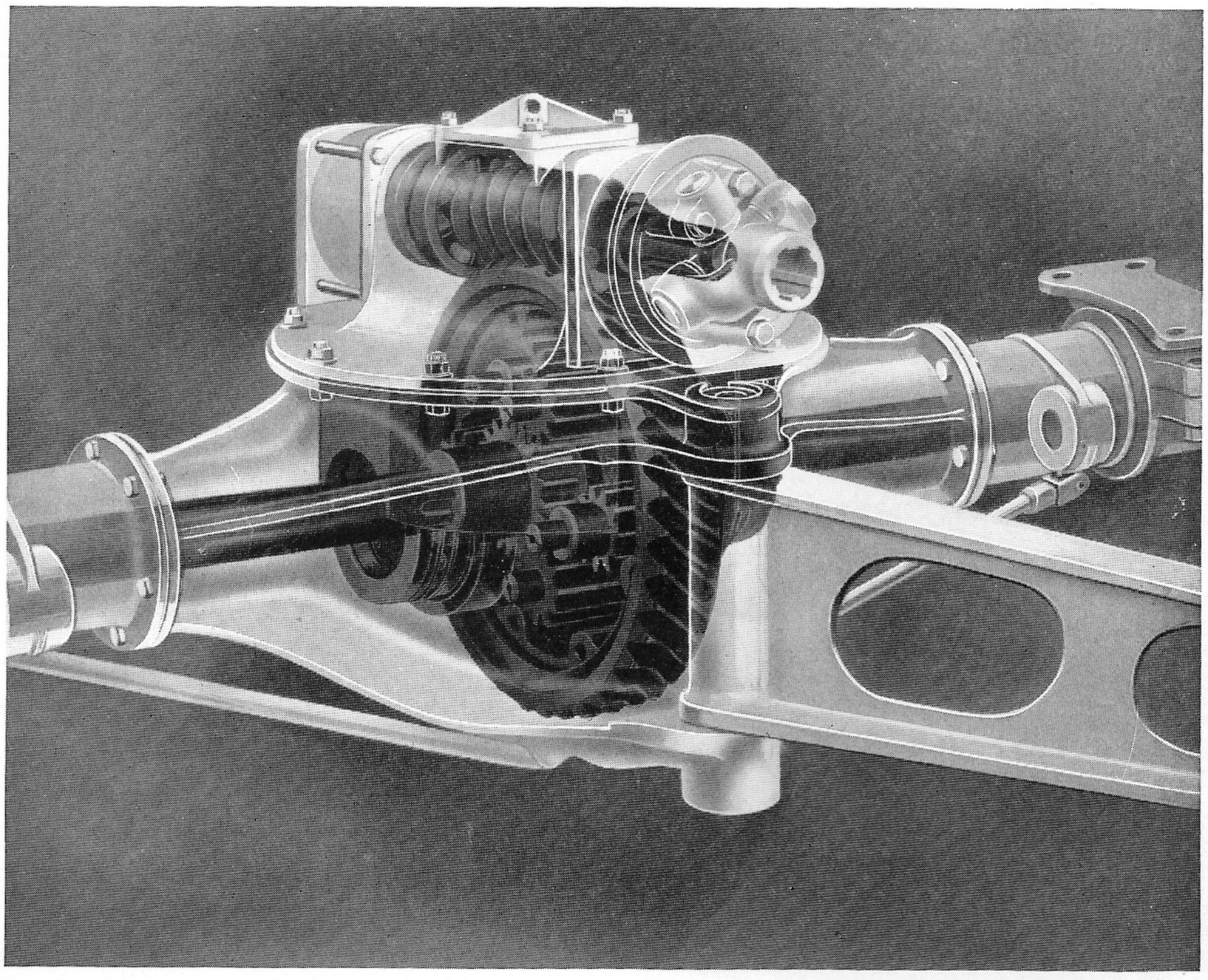
The joints are completely enclosed and all are packed with soft grease, except the forward one which runs in oil.

Bearings are all bronze, and pins hardened. The bearing surfaces are large and well lubricated, so that wear is small.

The drop-forged yokes are splined to the shafts, as no square shafts are used at any point in the truck.



MOTOR OILING SYSTEM



PHANTOM VIEW OF THE WORM DRIVE

Final Drive

THE Pierce-Arrow rear axle is of the worm-gear drive full floating type. The central steel casting forms the housing for the worm-gear mounting and serves as an oil- and dust-proof cover for the working parts.

Two seamless high tensile strength tubes carefully ground to size are shrunk into the main housing; on these run the wheels.

The brake-shoe supports and spring seats are placed upon separate housings slipped over the axle tubes.

Timken roller bearings of large capacity are used in the wheels, and drop-forged flanges connect them to the axle shafts. These axle shafts are of the highest grade chrome nickel alloy steel carefully heat treated with splined ends. Each axle is scleroscope-tested and examined for conformance to specifications.

The worm gears are made by the Timken-David Brown process, insuring perfect bearing contact between the worm and wheel. The worm is of special alloy steel carefully hardened and ground on the flanks of the teeth after hardening. Each individual worm is tested by scleroscope.

The wheel is a special phosphor bronze alloy of great strength and toughness. Each wheel is also tested by scleroscope or Brinnel test for conformance to our standards.

The spur-pinion type of differential is mounted inside the worm wheel in a housing which allows of perfect lubrication. The differential pinions are hardened and ground as well as the pins upon which they run.

The complete unit of worm and wheel is rigidly mounted on large ball bearings in a cast steel member, which at the same time acts as a cover for the axle housing.

In mounting the worm gears, the greatest care is used in securing correct

alignment. To get the correct "sidewise" position of the wheel, Prussian blue is put on the worm, and wheel moved sidewise in either direction until the correct contact is secured (shown by the transfer of the pigment to the wheel). When it is in this position, spacers of proper thickness are put in at the sides, thus a correct position for the worm and wheel is obtained which cannot change excepting as the large ball thrust bearings wear. This is so small as to be entirely negligible.

The complete unit runs in a bath of heavy oil, thus insuring perfect lubrication and absolute freedom from dust or grit, which is present in most other forms of drive.

The Pierce-Arrow Motor Car Company feel a considerable amount of pride with reference to their rear axle, as in the similar case of the flexible frame they pioneered the worm-gear drive in this country and have seen it gain in popularity until at the present time over half of all the commercial vehicles manufactured in America have this form of final drive, and it is only a question of a very short time before it will practically be universal.

Among the mechanical advantages may be noted extreme simplicity, due to only two moving parts as against the large multiplicity of parts with other forms of drive, such as double reduction axles, chain drive and internal gear drive.

The worm gear is silent in its operation and is notable for this fact, as it is the only form of gearing approaching absolute silence.

The worm gear possesses enormous strength. In fact, with the gears properly proportioned they represent the strongest unit in the transmission of power from the engine to the wheels.

The worm gear is remarkably efficient, due to the perfect lubrication, the limited number of bearings and shafts, and but one change in direction of power from the engine to the rear wheels.

The worm gear represents the highest attainable efficiency under the peculiar requirements for commercial vehicles where light weight, low cost of replacement, large gear reduction, high road clearance and a minimum of attention are all of the greatest importance.

Torque and Radius Rods

As the rear springs are mounted in center on bearing blocks and supported in full shackles at both ends, some provision is necessary to prevent the axle shifting back and forth and rotating under the normal driving and braking efforts. These provisions are taken care of by the torque and radius rods. These rods are malleable steel castings and convey the driving and braking effort from the rear axle to the chassis frame.

It would be possible to attach the springs rigidly to the axle and shackle direct to the frame; however, this would not be a satisfactory arrangement, as truck springs cannot be designed to carry loads varying from nothing up to many thousand pounds and, in addition, take the various driving strains.

The torque rod takes the rotative or torque reaction, and the radius rods take the forward and backward driving reaction.

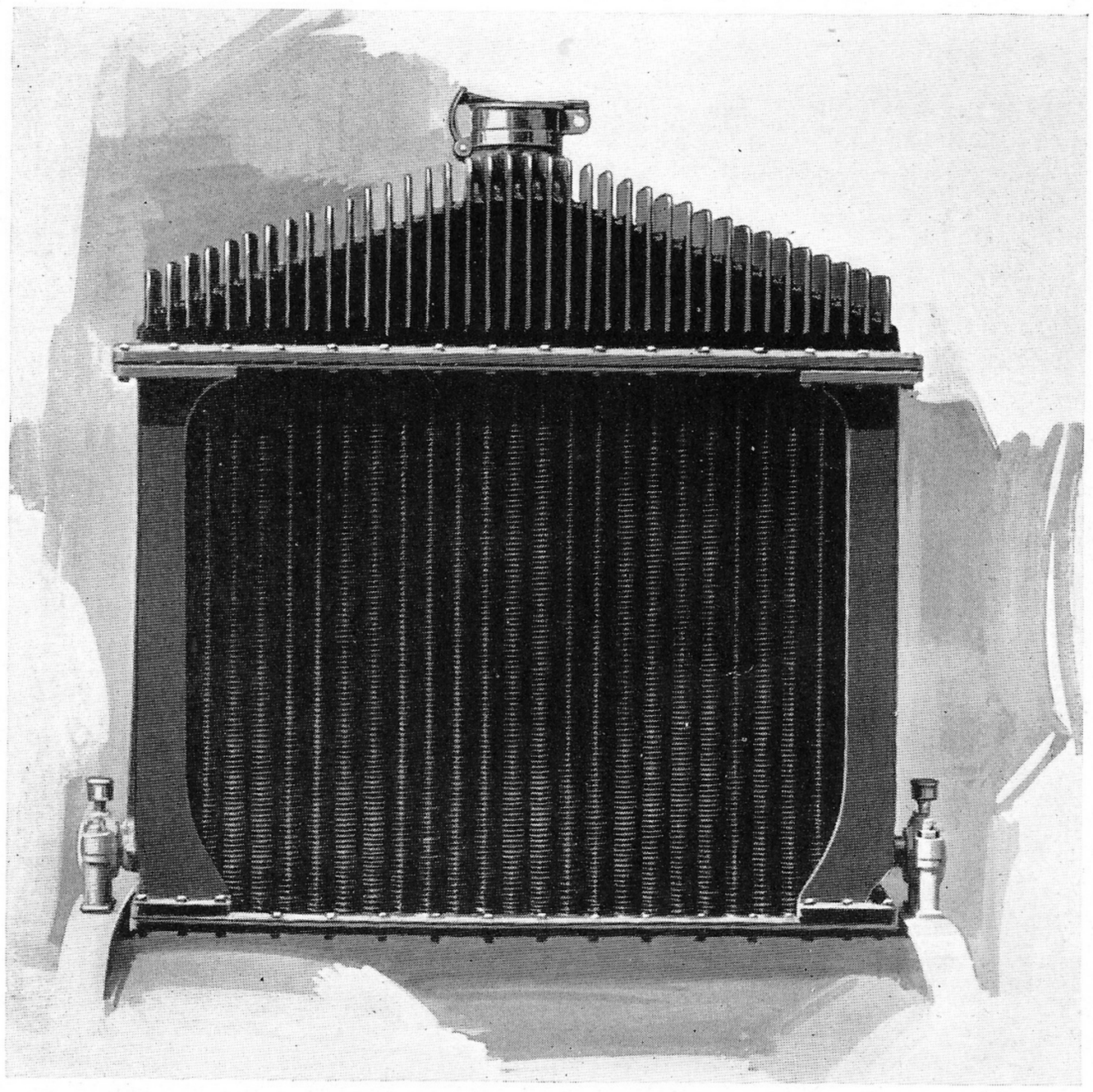
The axle must have perfect freedom of movement; consequently, the connections of the torque and radius rods must be designed to work in all directions.

Many makers overlook this fact, hoping that the flexibility of the members will compensate. However, this is a makeshift that costs little but can never be satisfactory over any length of time.

The type of end connections used exclusively on Pierce-Arrow trucks comprises flexible ball socket and pin joints at both ends of the radius rods and the forward end of the torque rod.

The fixed length one-piece radius rods as against adjustable ones used on chain-driven trucks insure perfect rear axle alignment at all times with consequent saving of bearings, tires and fuel.

With torque and radius rod construction such as is used on Pierce-Arrow trucks it is always possible to stop the truck by means of the brakes, in case a spring breaks.



RADIATOR

Cooling System

Radiator

THE engine is water-cooled with positive centrifugal circulating pump, a large vertical tube radiator of eight gallons capacity with cast aluminum tanks and flexibly mounted on ball-jointed trunnion blocks.

The radiator is exceptionally light for its size and capacity and of pleasing and distinctive appearance.

The original design of Pierce-Arrow truck radiator included cross tubes with expanded and soldered ends; top, bottom and sides of aluminum, and mounted in ball-jointed trunnion blocks. Certain difficulties arose, such as loosening tube ends and failure of side plates.

With this experiefince, the design was changed to the present type, incorporating vertical tubes with ends tinned and the tube plates dipped to insure against leakage, malleable iron sides of exceptional strength, larger ball trunnion mounting, cast fins on top of upper tank and distance rod between radiator and dash, with two small universal joints to allow for motion of radiator relative to dash caused by the weaving of the chassis frame. This type of radiator has the following advantages:

It will withstand excessive vibration, due to the absence of long soldered joints and flexible mounting as against the average spring mounting which allows radiator to thrash and pound, breaking those connections and hood sides.

It is more efficient thermally, due to the absence of small passageways in the typical honeycomb radiator which clog up with dirt, rust, scale and foreign matter.

Furthermore, this type of radiator can be completely drained in cold weather or for purpose of cleaning.

The fins on the upper tank not only give a pleasing appearance but inasmuch

as the hottest water is delivered at this point a square inch of surface is equivalent to approximately three square inches lower down.

It is more easily repaired in case of accident. The cellular type of radiator is notoriously difficult to repair, and repairs usually result in lowering the efficiency of the radiator and are never permanent. A single tube can be replaced or repaired in the Pierce-Arrow radiator or it can be completely rebuilt; the repair is easily accomplished and is permanent.

The radiator is built entirely in the Pierce-Arrow factory. This insures the highest standards of material and workmanship and absolute uniformity of production.

The Pierce-Arrow radiator has many imitators. In fact, the English Government has seen fit to design a subsidy type of radiator similar to that used by the Pierce-Arrow, and are replacing radiators of several makes of American trucks in use by the English Government with this new type.

Water Pump

The water pump is located on the left-hand side of the engine and consists of a single moving part with complete absence of valves or other mechanism.

The advantages of this type are that it requires a minimum of power to operate, needs no adjustment, and there is a special coupling on the water pump shaft arranged to let go should the pump freeze up. In this way it eliminates the possibility of injury to the gears or other parts.

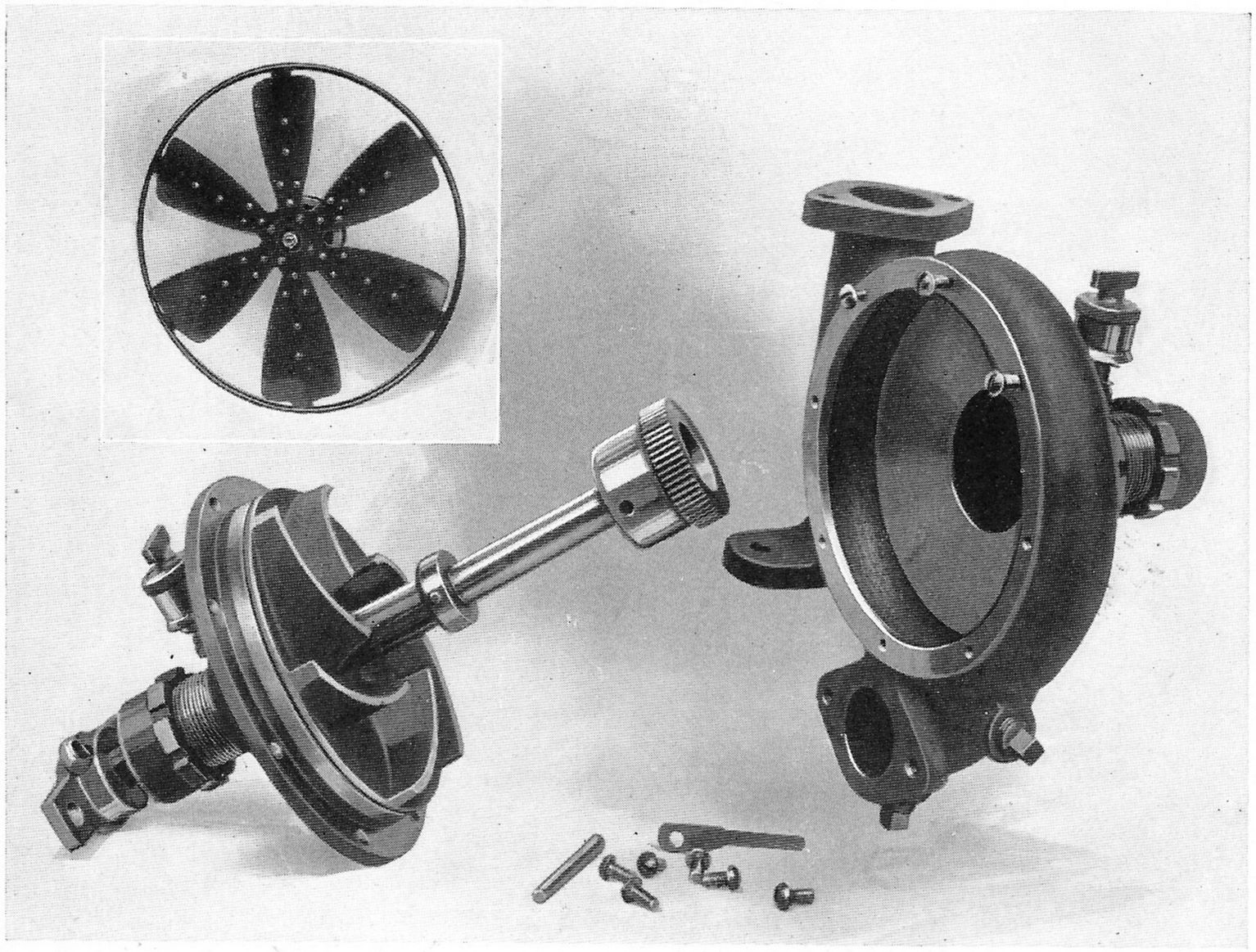
The direction of flow is the same as in a thermo-siphon system, and should the circulating pump stop working, the circulation will continue, as the flow of water is not restricted at any point.

Fan

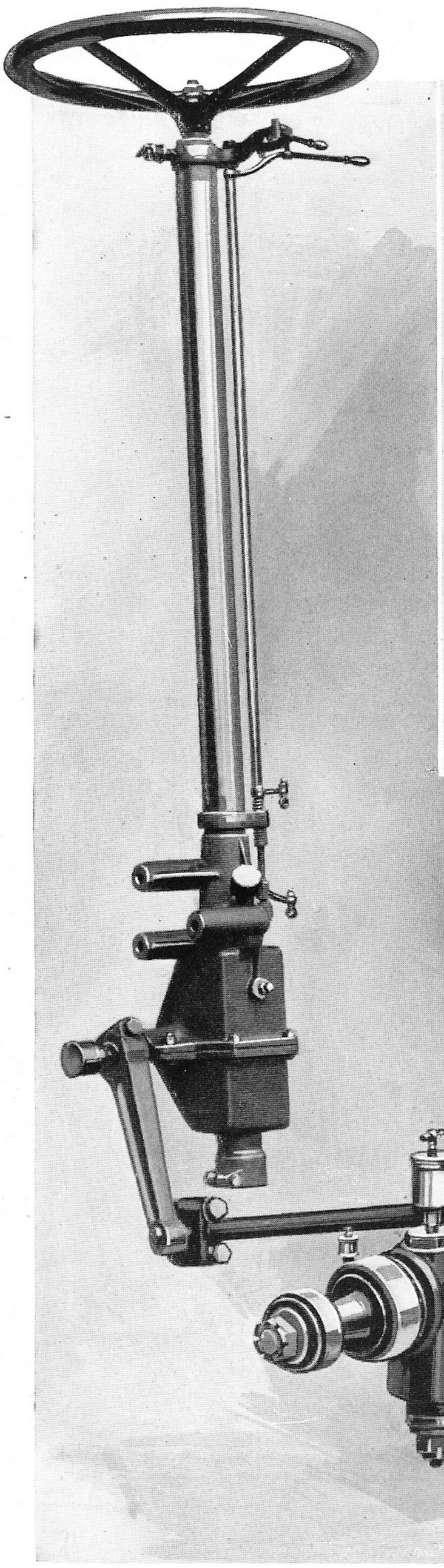
The cooling is assisted by a six-bladed fan driven by means of a belt from a pulley on an extension from the water pump shaft.

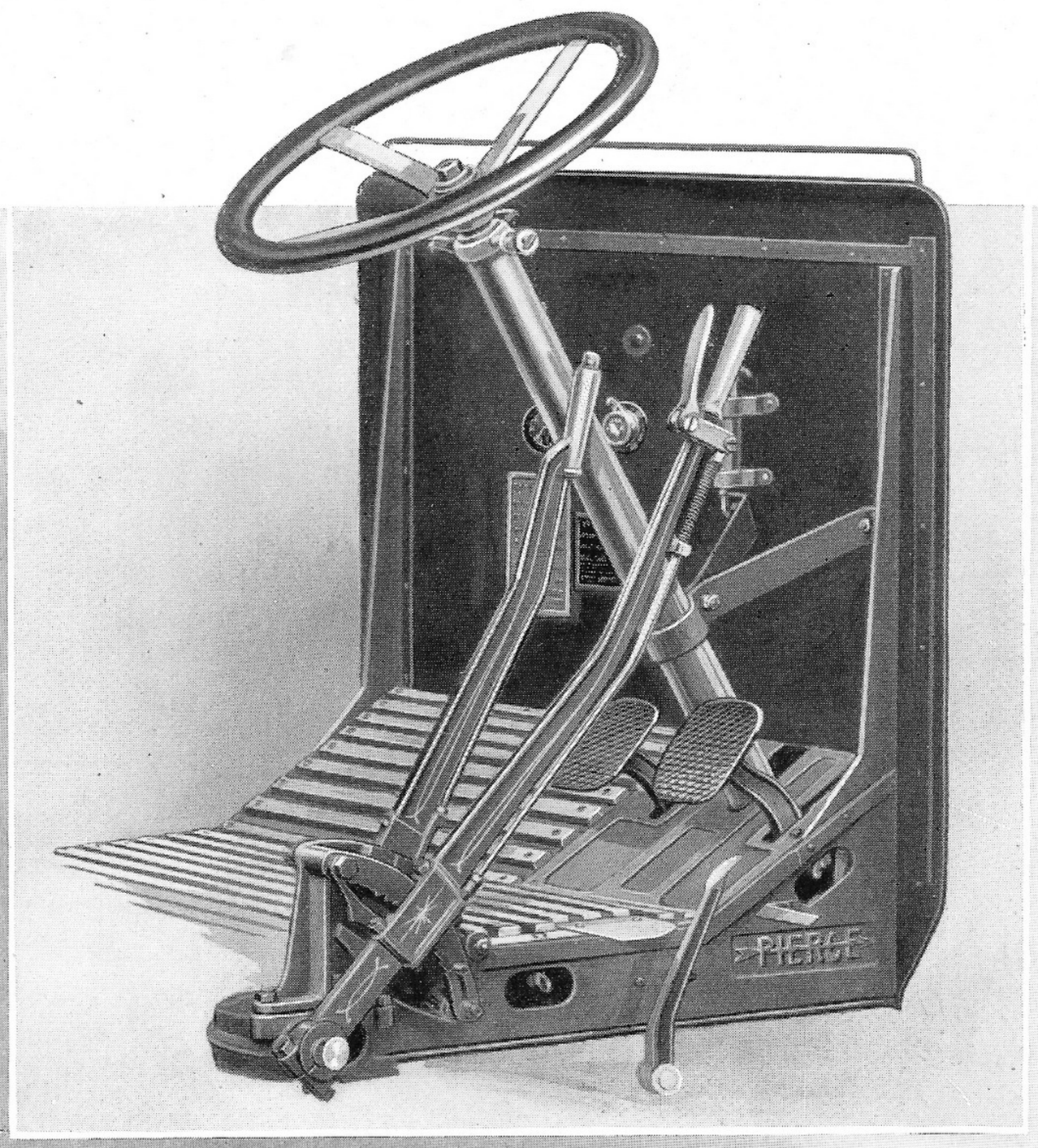
The fan spindle carries two ball bearings and the adjustment of the belt is accomplished by means of a simple wing nut and slotted bracket.

The advantages of this type of fan are the ease of adjustment, the use of an endless belt especially adapted for this work, and the small amount of power (occasioned by the large capacity of the radiator) necessary to drive the fan.



FAN AND WATER PUMP





STEERING ARRANGEMENT AND CONTROL LEVERS

Steering Gear

THE type employed is known as a semi-reversible screw-and-nut system and is located on the right-hand side of the vehicle.

The steering column is inclined to a comfortable angle for the driver and operates on the same ratio as the steering gear in the Pierce-Arrow touring cars.

The steering knuckles are of the yoke or reversed Elliott type of heat-treated special chrome nickel steel.

The pivot axle pins are of large diameter, running in radial and thrust bushings of bronze, amply lubricated by large grease cups. The coupling rod is secured to the steering arms by a fork and clevis at either end with hardened steel pins and bushings.

The drag link is fastened by a ball joint with hardened steel surface at each end. The drag link is placed above the ball and not suspended from it. The semi-reversibility allows the driver to feel objects encountered by the front wheels, thus preserving alignment of wheels with consequent tire saving. The absence of bent steering connections insures continuous operation and driving confidence on the part of the driver. Also when driving in ruts the driver can feel the road and thus save tire wear.

The high steering ratio allows of handling vehicle in traffic and at a high average speed under all conditions. This induces confidence in the driver and is equal to insurance against dangerous accidents often caused by the driver's inability to control the vehicle in an emergency.

The weight distribution of the Pierce-Arrow truck also permits of easy steering. The weight is so proportioned as to give practically a constant load on the front axle. This not only facilitates steering, but allows of flexible springing with the consequent absence of vibration on the front part of the machine when running unloaded. This is not the case with the great majority of trucks.

The screw-and-nut type of construction is seldom used by manufacturers, due to its cost. It insures uniform action without perceptible wear, over a great period of time.

The commonly-used worm-and-sector type has an area in contact between the working parts of less than one quarter of one square inch; hence the considerable wear, and this wear cannot be taken up or compensated for, as it takes place only near the center position. Consequently, any attempt to take up this wear would cause the gear to bind when turning through any angle.

The Pierce-Arrow screw-and-nut type with a square section four-thread screw and nut gives approximately three square inches of area always in contact, thus insuring easy and smooth operation and long life.

These members are of cast aluminum alloy. They possess lightness, strength, durability, and can be formed with the necessary lugs and reinforcements to stand up under this severe service. The first cost is greater than the commonly used laminated wood type; however, greater satisfaction at all times is assured.

The driver is placed on the right-hand side of the truck with both levers at his right hand.

This position has always been used on horse-driven vehicles, and the drivers know it best and prefer it. It gives the best view of the curb when turning corners, of the ditch when on country roads, of people about to cross the street ahead, and in backing into the unloading position.

The right is the only hand for lever operation, as the majority of people are slow and awkward, and distrust the left hand. The spark and throttle levers are conveniently located under the left side of the steering wheel.

There is also a foot throttle operated quite independently of the hand throttle. This is located between the clutch and brake pedals.

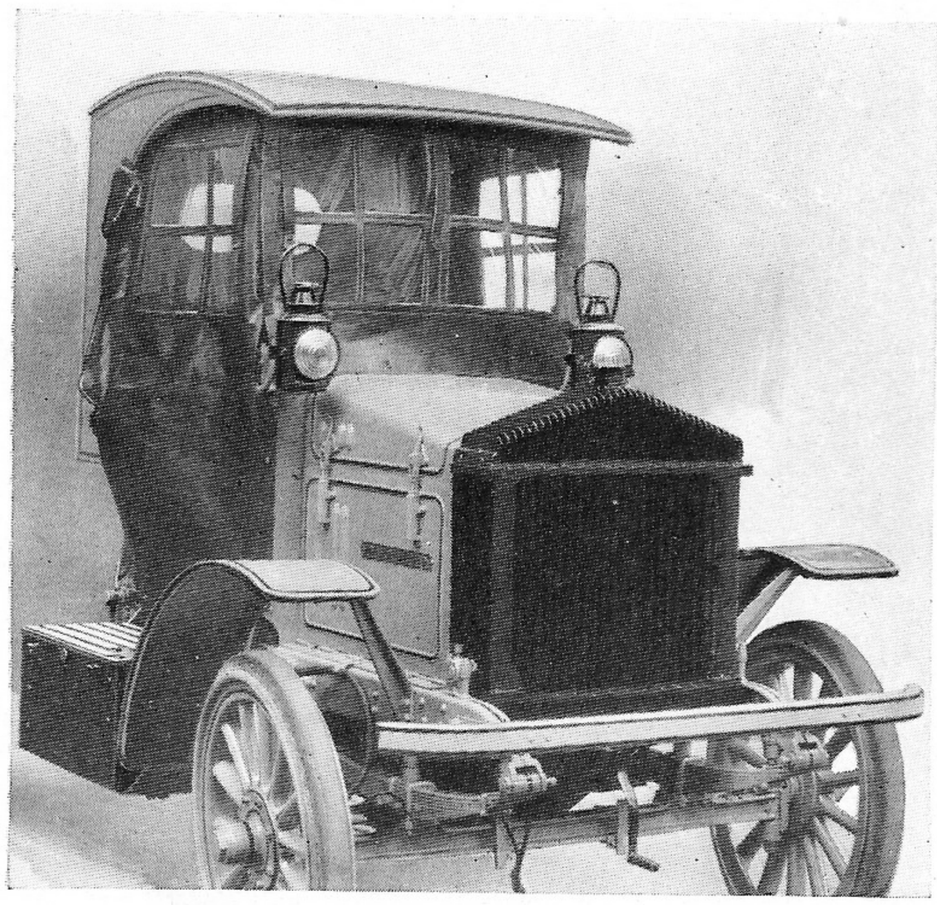
There are many arguments put forward in favor of other positions for the driver and other methods of control; and the Pierce-Arrow Company have constructed vehicles with left-hand drives as well as right; but from a comprehensive study, the right-hand steer and right-hand control have been selected as answering requirements in every particular.

The wheel is tilted at an angle, and ample foot room makes for the comfort of the driver.

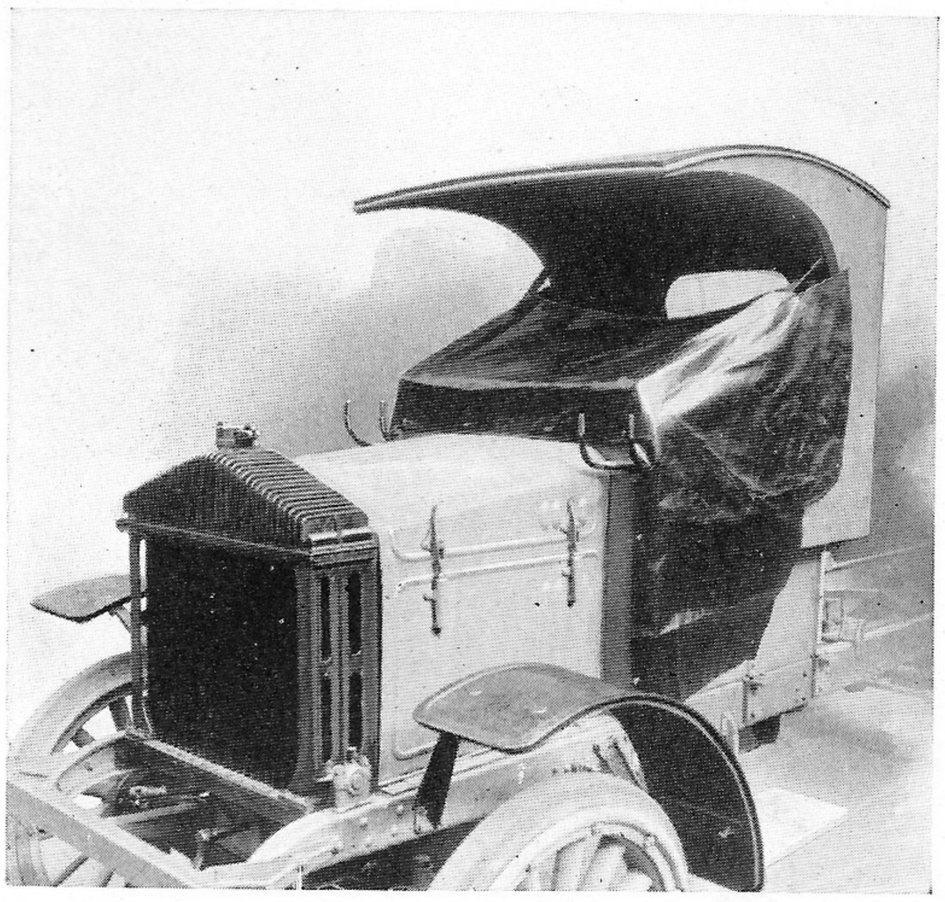
The construction of the cab and seat cushions is also carefully thought out with a view to providing clear vision and ample protection to the driver under adverse weather conditions. We furnish two types of storm curtains; the so-called old style—which entirely enclose the driver's compartment with celluloid windows in front, sides and rear—or the new style curtain of the apron type with direct vision and ease of ingress and egress, but not the complete protection afforded by the old style curtains. The two types are optional, but where not specified the new type is supplied.

Ignition System

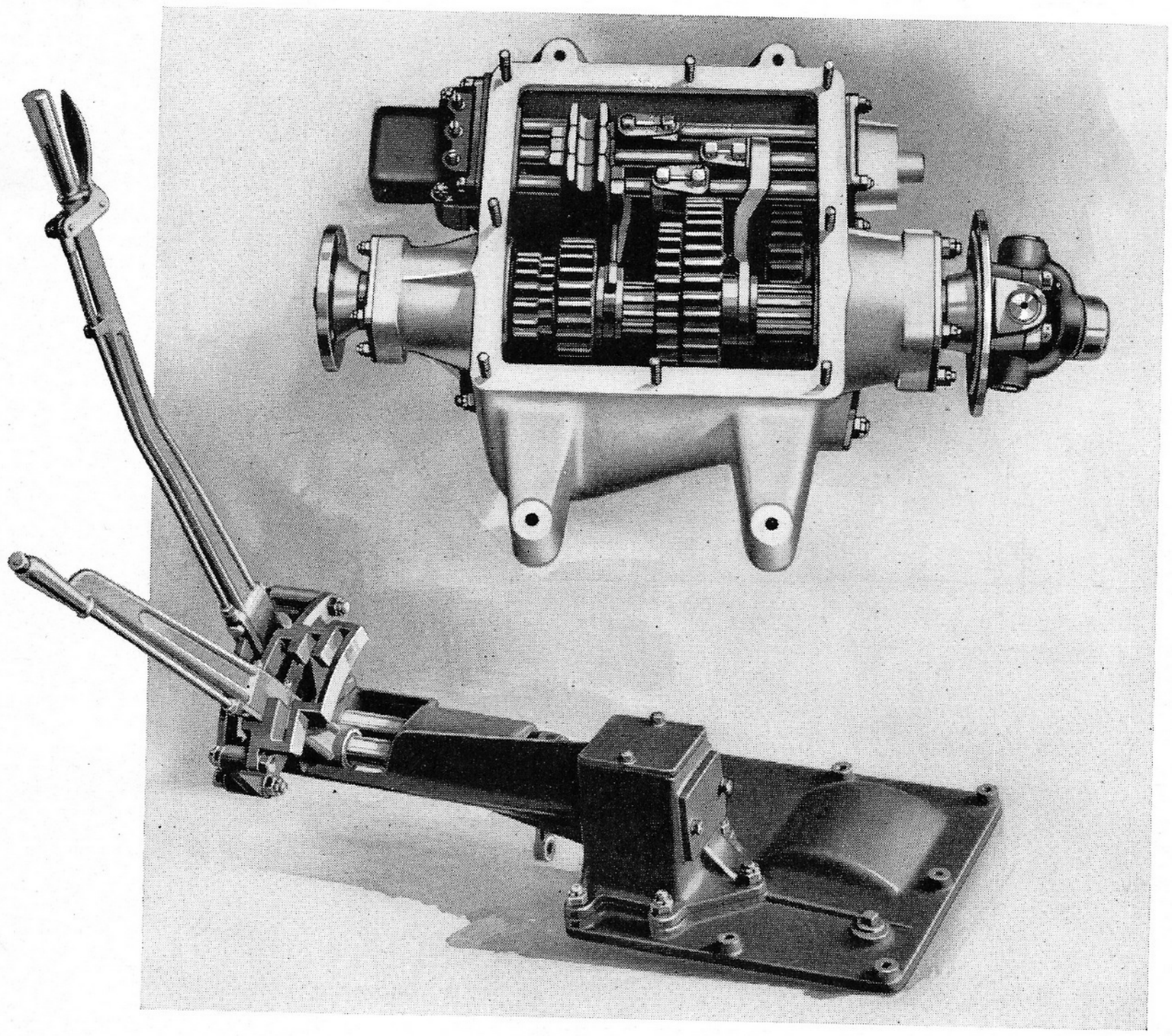
The ignition system on the 2-ton is by Eisemann dual high tension magneto with Columbia dry cell battery for starting; the wiring is of the aerial type, thus eliminating trouble from static charges set up in certain types of wire containers.



OLD STYLE CURTAINS



NEW STYLE CURTAINS



TRANSMISSION

Transmission System

THE transmission used is of the four-speed selective sliding gear-type, housed in an oil-tight cast aluminum case and suspended in a sub-frame. On top speed, the drive is direct without any power transmitted through the gears.

All gears are of large proportions and are of a special chrome nickel steel, heat treated and case hardened to give strength and wearing qualities. Each gear is scleroscope-tested for hardness and also inspected for tooth form and size.

The main shaft carrying the sliding gears is splined instead of square as in ordinary practice, and is mounted on double annular ball bearings with special oil deflecting propellers and felt washers to prevent leakage at either end.

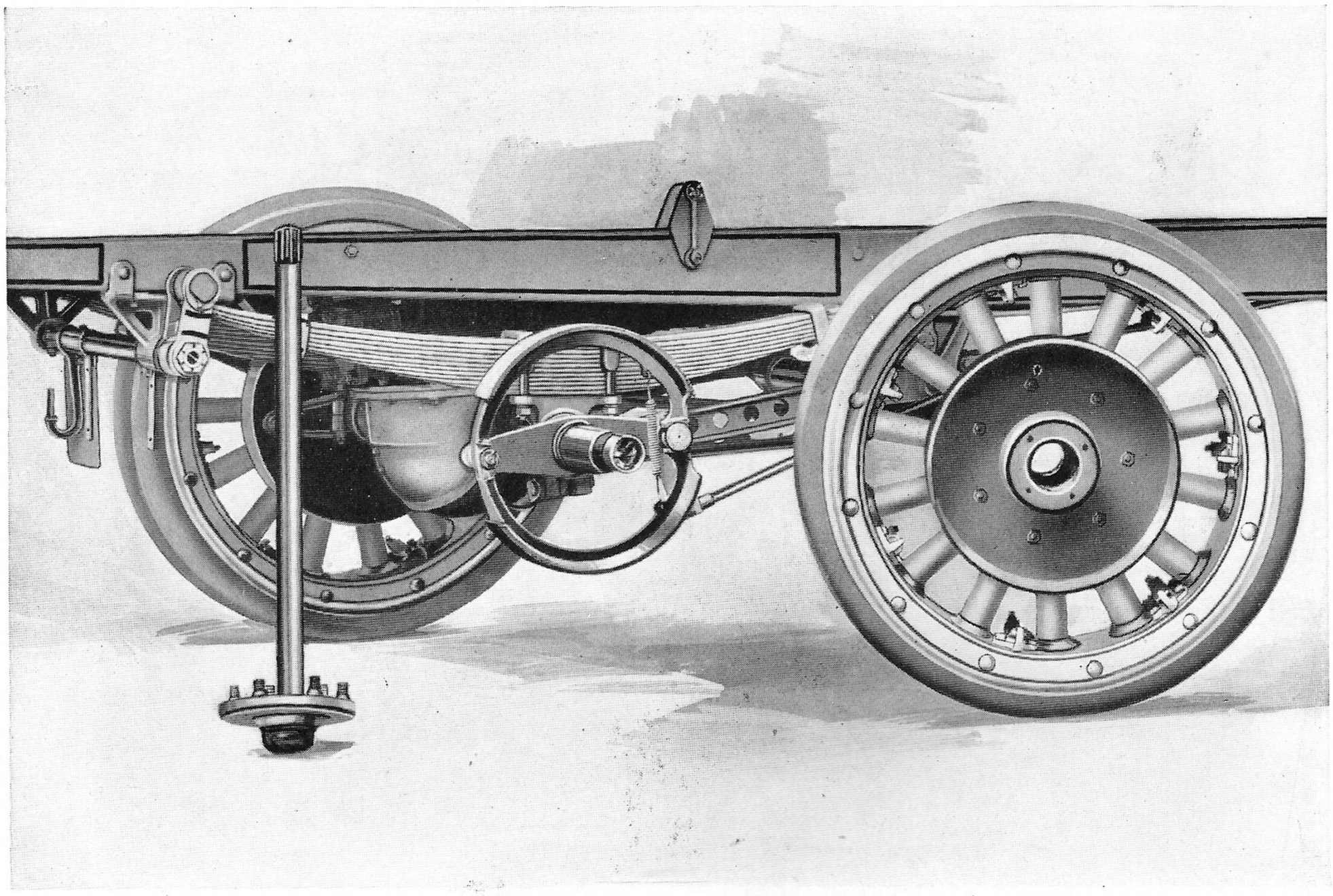
The shaft yokes are hardened and ground to size, and arranged with a double locking scheme which both holds the gear in mesh and also absolutely prevents more than one pair of gears in mesh at a time.

The cross shaft on gear shifting lever is mounted in a housing integral with transmission, to prevent binding when chassis frame moves relative to the transmission.

The sub-frame suspension feature insures perfect alignment at all times.

By locating the transmission midway in the chassis, the driving shaft is divided up into lengths, so as to eliminate excessive vibration on universals and also make the clutch accessible for inspection or demounting.

The splined main shaft has many advantages over the squared type; it presents more surface in contact, also eliminates the possibility of the gear jamming on the shaft in sliding.



EMERGENCY BRAKES

Brakes

THERE are two entirely independent brake systems; the service brake operated by the right pedal is of a contracting double-shoe locomotive type acting on the brake drum at the rear end of the transmission; the hand or emergency brake is of the internal expanding type located in large 16¾″ diameter drums.

There is a compensating device on both brake systems so that the brake effort is equalized.

In the case of the service brake, it means equal pressure applied by both shoes; and in the case of the hand brake, it means equal pressure applied in each brake drum.

The action of the service brake is controlled by double cams which operate directly on the brake shoes.

The hand-brake shoes are actuated by means of square blocks which force the shoes apart, giving a simple and powerful action with a minimum of parts.

The brake shoes of both systems are lined with a special heat- and wear-resisting fabric which can be renewed at a trifling cost. While the service brake only operates on a drum 10″ in diameter, nevertheless (due to the speed at which it runs—approximately seven to eight times the rear wheel speed—) the brake effort realized is equivalent to a 70″ to 80″ brake drum mounted on the rear wheels.

The independent system of brakes has two main advantages over the interconnected or adjacent types. The accidental breakage or failure of one system causes no interference with the other.

The heating action (due to continuous brake application on a heavy motor truck descending a long grade) is of very great consequence.

However, with the two independent systems this is compensated for, inasmuch as one system can be used at a time, while if the brakes are located to-

gether the heating action is accumulative and destructive, with danger of failure of brakes.

The shoes on the service brake are arranged to be easily demountable; it being only necessary to remove two cotter pins from the pins carrying the brake-shoe arms. This is a feature often overlooked in the design of brakes.

All fork and clevis ends are bushed with hardened and ground steel bushings. The pins are also hardened and ground. This insures accurate fits, the elimination of lost motion and absence of wear.

The adjustment of the service brake is accomplished by a large conveniently-placed nut held in position by a flat spring.

The hand-brake adjustment consists in taking up the brake-rod ends which are conveniently located.

Wheels

The wheels used on Pierce-Arrow trucks are of the artillery type, made up of best ash felloes and hickory spokes. The assembling is done in two-spoke sections which adds g r e a t l y to the strength and simplifies repairs.

The ends of rear wheel spokes are protected by malleable iron caps, an exclusive Pierce-Arrow feature.

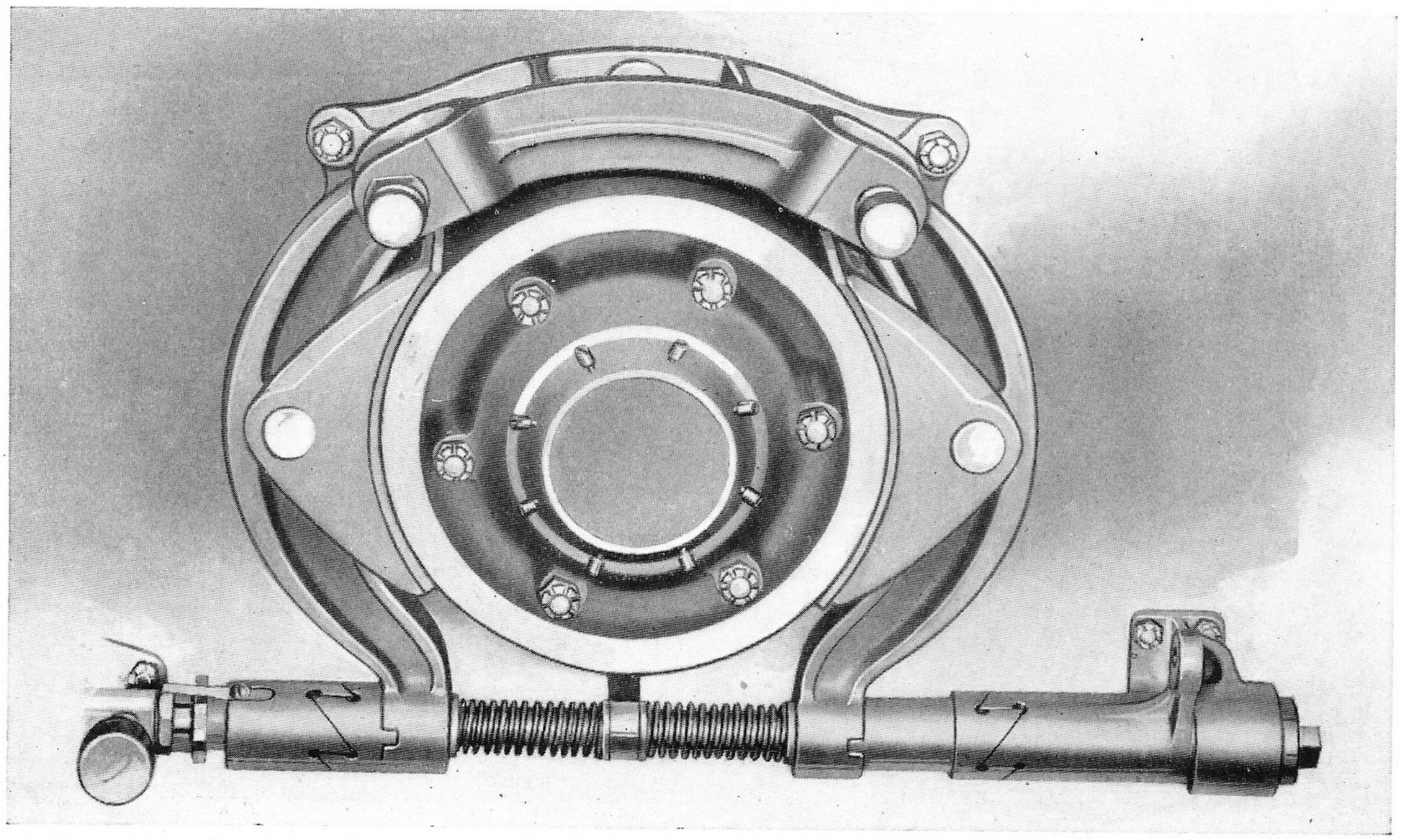
In a test we applied 6 tons over one spoke without the cap. The spoke started to bed into the felloe. Again a spoke with cap was subjected to a direct pressure of 19½ tons. The spoke failed, but not at the cap. In fact, the cap barely left a mark in the felloe. The caps are tapered into the wood felloe, thus adding to strength of the tennon of spokes.

While the Pierce-Arrow wheels are of massive design and construction, nevertheless they are of a very pleasing appearance, which cannot be said for a great many truck wheels.

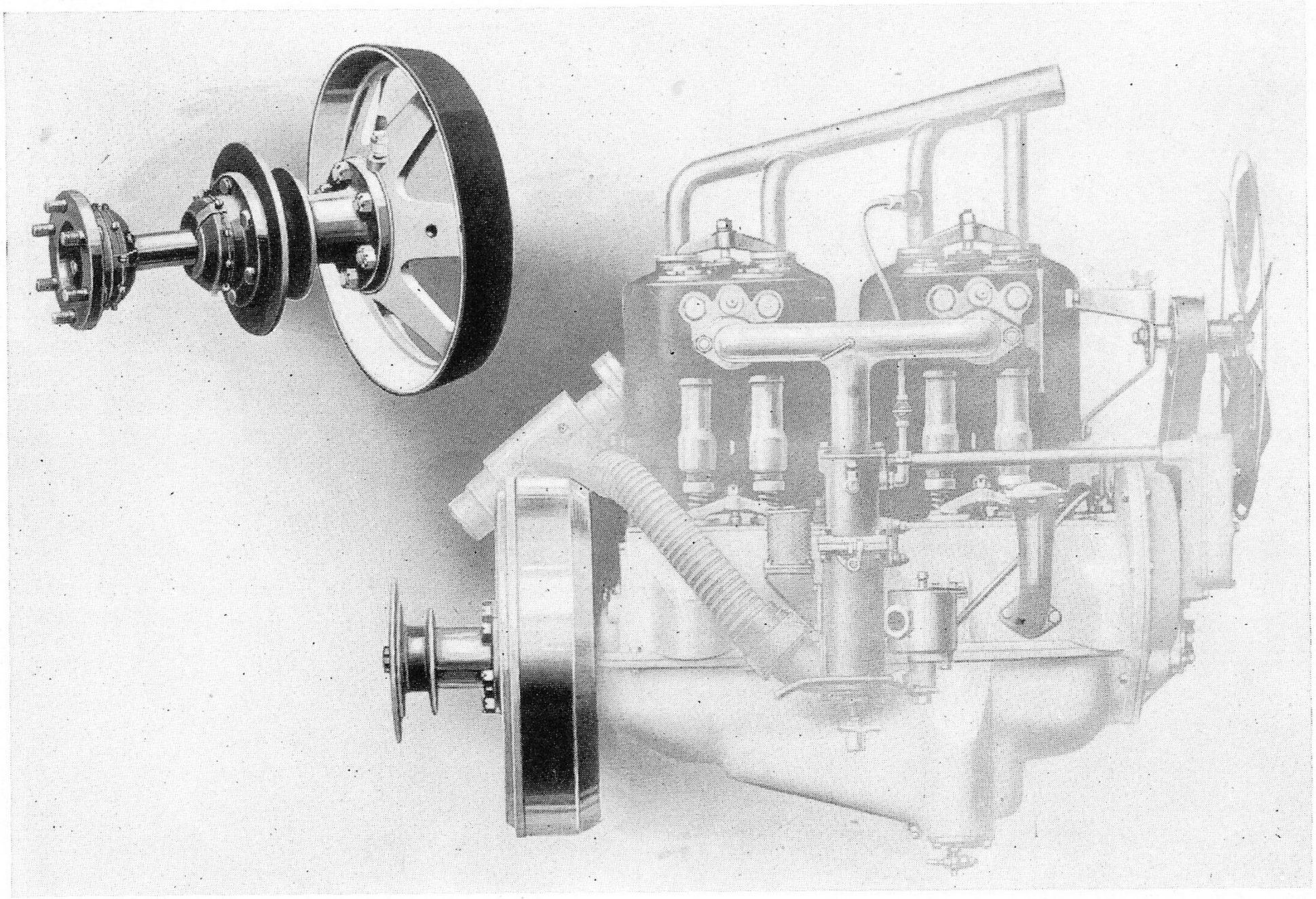
The wheels are made entirely in the Pierce-Arrow factory and, consequently, are held to the rigid requirements of other parts of the vehicle.

Unless otherwise specified, wheel rims are made to S.A.E. standard sizes.

The spokes in center of felloe construction—which we employ—is admittedly a better construction than the overhanging felloe commonly used.



SERVICE BRAKE



CLUTCH

Clutch and Clutch Stops

THE clutch is of the cone type with leather facing, and springs placed underneath the leather.

The cone itself is of cast aluminum alloy and engages in the engine flywheel. The leather covering is of a special grade sole leather and is soaked for three days in hot Neatsfoot oil to condition same.

Bolted to the cone is a demountable aluminum ring, against which spring controlled fibre pads come in contact when the clutch is withdrawn, acting as clutch stops to prevent excessive spinning.

An oil retaining ring of aluminum is attached to flywheel rim to retain a small quantity of Neatsfoot oil.

The cone clutch is without question the simplest form of clutch and has a minimum of wearing parts. It requires less attention than any other form and will outwear any other clutch.

An objection used to be cited against the cone clutch—the necessity for repeated hand lubrication. The Pierce-Arrow Company developed an exclusive feature in the oil retaining ring, which permits the leather to run in a continuous supply of Neatsfoot oil, which supply lasts for a month without replenishing.

Due to the well known wedging action, a cone clutch is invaluable when quick application of power is desired, as in getting out of mud holes and other strenuous requirements.

While the cone clutch is capable of harsh action where necessary, nevertheless the Pierce-Arrow design, with oil bath and six small flat springs placed at equal intervals around the cone, makes possible a smooth and gentle engagement quite impossible with other types.

Another feature of the cone clutch is the absence of dragging, thus reducing clutch wear and facilitating gear shifting.

Equipment

THE following is supplied as standard equipment on all Pierce-Arrow chassis: two side lamps (oil), one tail lamp (oil), license-number attaching plates, cab top, cushion, curtains, frame sills, skid chains, pigtail towing hooks and painting to specifications.

Mileage recorder. Hand Klaxon type horn mounted conveniently on cab.

Heavy reinforced tool box mounted on rigid brackets, attached to the chassis frame and located on right-hand side of machine. Tool box has armored top and Yale lock with duplicate keys; and interior is arranged with compartments, and with straps to hold the contents firmly in place. A special mounting is provided for the vise when it is used on the road.

The equipment is unusually complete. It is furnished in the belief that the owner of a chassis will require a great majority of these necessary accessories, and with our experience we can offer something that has proven satisfactory and is in perfect harmony with the rest of the vehicle. This is a safeguard to us as well as to the owner, as the longer the truck is in service the more it is appreciated.

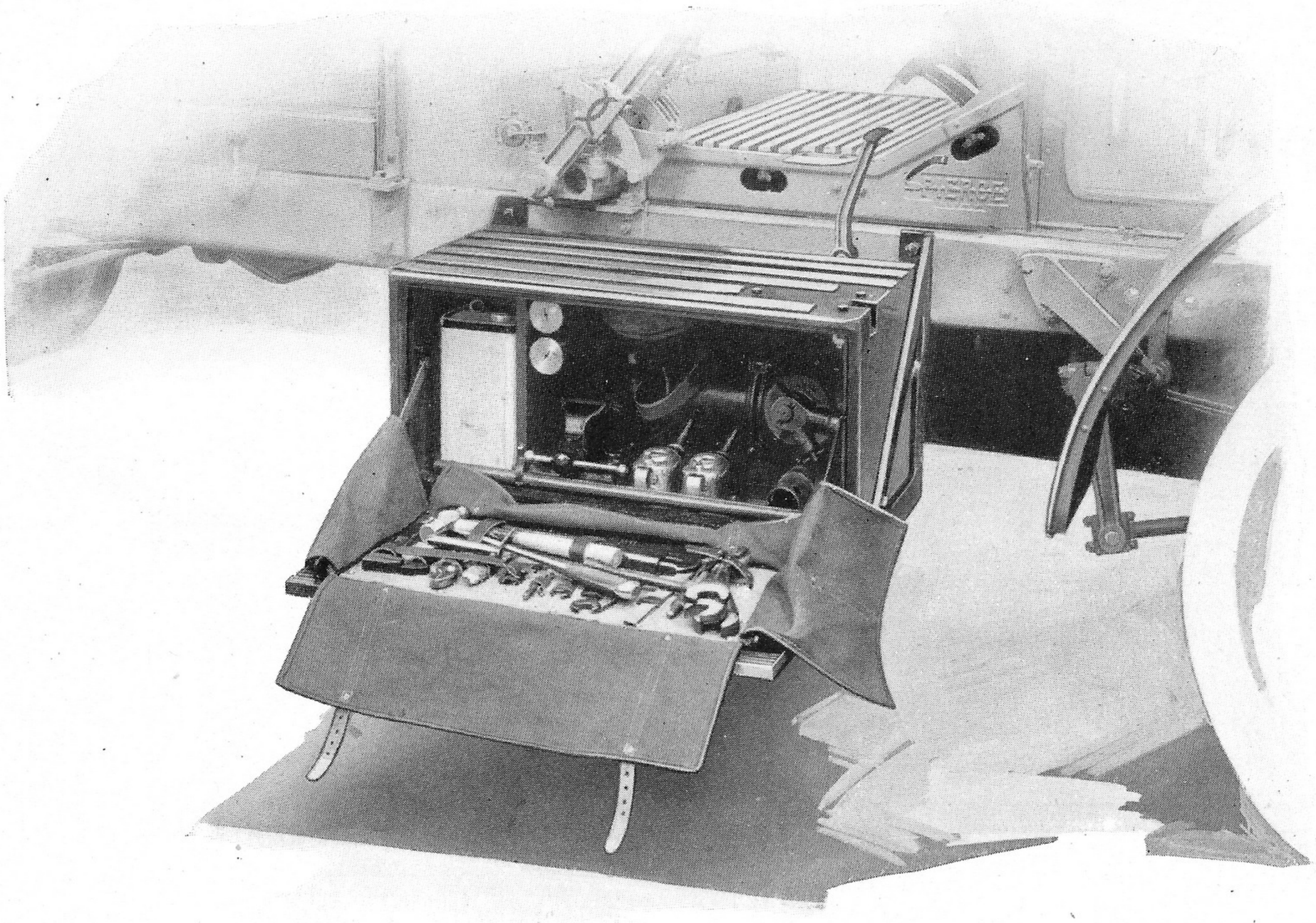
The tool box contains:

1 5-lb. can Duplex gear grease.
1 1-lb. can Kasson's lubricating compound for water pump.
1 1-gal. can No. 1 or No. 350 Duplex motor oil.

1 Neatsfoot oil can.
1 machine oil can.
1 8" flat mill file.
1 6" round bastard file.
1 No. 6488 funnel.
1 No. 96 hammer.
1 jack.
1 rubber pail.
1 8" Reed pliers.
1 grease pump.
1 nail set.
1 6" B. & S. wrench.
1 7" B. & S. wrench.
1 14" B. & S. wrench.
1 2" perfect handle screwdriver.
1 8" perfect handle screwdriver.
1 No. 723 open end wrench.
1 No. 27 open end wrench.
1 hub cap wrench.
1 magneto wrench.
1 spray jet socket wrench.
1 fan belt.
2 spark plugs.
1 vise.
Cotter and taper pins.

In addition the 2-ton tool box contains:

1 No. 23292 open end double head wrench.
1 No. 1036 open end double head wrench.
1 No. 36819 open end double head wrench.
1 No. 967 D socket wrench for crankshaft.
1 No. 20361 valve cap wrench and handle.



TOOL BOX

Service

THE record of sustained excellence of design, material and workmanship that has characterized the Pierce-Arrow output from the earliest days carries with it no light responsibility.

Purchasers of Pierce-Arrow trucks trust largely in this record. Should they be disappointed; should we fail to live up to our responsibilities; we would lose those future sales and repeat orders that mean continued success.

We believe that the purchase of a Pierce-Arrow truck should mark the beginning of a long and mutually profitable relationship between its owner and the Pierce-Arrow organization. We believe that the cost of maintaining a Pierce-Arrow truck should be comparatively low. We cheerfully assume our full share of responsibility for the amount of this cost, but we also recognize that this responsibility is not all ours.

There are four factors determining the cost of maintenance of a truck.

FIRST: The comparative excellence of design, material and workmanship.

SECOND: Conditions of operation.

THIRD: Care in handling, lubricating and cleaning.

FOURTH: The general efficiency of the shop in which repairs are made.

The Pierce-Arrow Motor Car Company assumes full responsibility in connection with the first factor.

The relative importance of the second and third factors depends entirely upon the owner of the truck, though the co-operation of the Pierce-Arrow service force, heartily accepted, can do much to reduce it.

So long as a truck owner makes use of the repair shop of a Pierce-Arrow agent, the fourth factor remains a Pierce-Arrow responsibility.

In order that the co-operation with truck owners may be of the greatest value, and the efficiency of the agent's repair shop of the highest quality, Pierce-Arrow service has been developed along four distinct, though inseparably related, lines.

The first of these lines is in the direction of service spirit—the desire to serve.

The second is in the direction of adequate equipment—a complete stock of readily accessible spare parts, combined with a shop layout and installation sufficiently complete to meet every reasonable demand.

The wrong men, even if possessed of the right spirit and ample shop facilities, will fail to give good service.

The third line of development is, therefore, educative. Its aim is to secure efficient service men, educated in service methods.

The fourth line covers organization—systematic planning and laying out of work; economy of effort where economy is desirable; rapid and efficient work, promptly delivered, at a minimum cost to the truck owner.

Service spirit, adequate equipment, personnel, organization—these are the elements of good service, and it is the constant effort of the Pierce-Arrow Motor Car Company to assist its agents to maintain such service for all Pierce-Arrow owners.

Specifications in Brief of Pierce-Arrow Motor Trucks

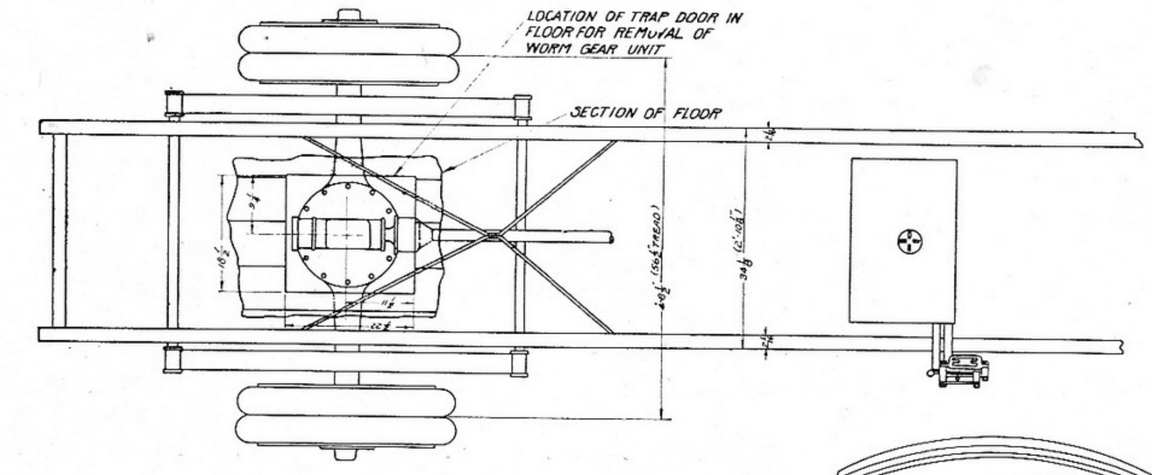
Both 5- and 2-Ton Chassis are Made in Two Lengths

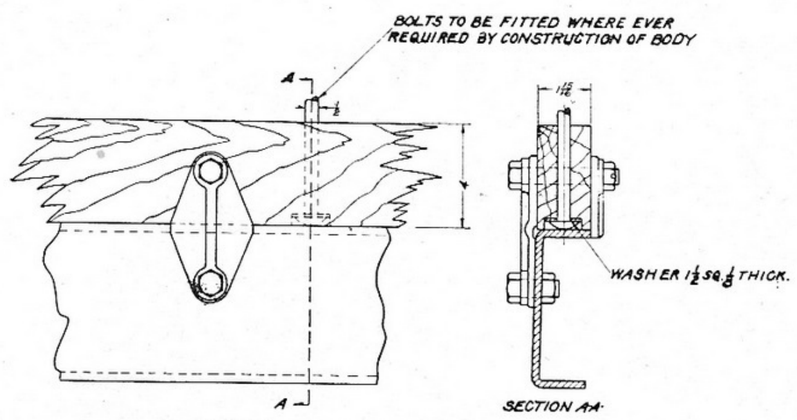
	2-TON	5-TON
No. of Cylinders.	Four, cast in pairs.	
Carburetor	Special Pierce-Arrow automatic, gasoline, gravity feed.	
Control	Hand throttle and foot accelerator.	
Oiling	Automatic to all crankshaft and pin bearings, cylinder and pistons.	
Clutch	Cone type.	
Transmission ...	Selective, sliding gears, direct on high speeds. Side lever control. Worm gear drive.	
Speeds	Four forward—one reverse.	Three forward—one reverse.
Bearings	Ball and roller all over except the motor.	
Springs	Semi-elliptic.	
Wheels	Artillery type.	
Brakes	Foot brakes on outside of drum on rear of transmission. Equalized hand brakes on inside of drums on hubs, both rear wheels.	
Frame	Channel section pressed from special steel and heat treated.	
Steering Gear...	Nut and screw type.	
Radiator	Tubular type—vertical tubes.	
Revs. per Minute	350 to 1250.	250 to 950.
Ignition	Eiseman dual system.	Eiseman dual system.
Tires	36 x 4 front, single. 36 x 4 rear, dual. Solid.	36 x 5 front, single. 40 x 6 rear, dual. Solid.
Tank Capacities.	Gasoline, 15 gallons. Water, 8 gallons. Oil, 1 gallon.	Gasoline, 25 gallons. Water, 11 gallons. Oil, 1 gallon.
Wheel Base.....	12 feet, 6 inches, standard. Long chassis, 15 feet.	14 feet, standard. Long chassis, 17 feet. Short chassis, 11 feet.
Tread	56 inches.	69 inches.
Chassis Over All	18 feet, 6 inches long, 5 feet, 6 inches wide, standard. Extra long, 21 feet, 6 inches.	20 feet long, 7 feet wide. Long chassis, 24 feet long, 7 feet wide.
Platform Dimensions, Back of Driver's Seat..	Standard, 10 feet, 6 inches long, 6 feet wide. Extra long, 13 feet, 6 inches.	Length, 12 feet, 8 inches, width, 7 feet. Long chassis, to specification.
Height of Floor (from Ground, Loaded)	3 feet, 6 inches.	3 feet, 10 inches.
Speed	16 miles per hour.	14 miles per hour with standard gear.
Price	$3750.	$5500.

Chassis equipment includes the running gear, tires and mechanism complete; driver's seat, top, dash and foot boards, front mud guards, side and tail lamps, odometer, horn, jack and full set of tools, coil with battery, pigtail towing hooks, tire chains and hooks for rear wheels, and magneto and gasoline tank. Wood sills clipped to frame for mounting body.

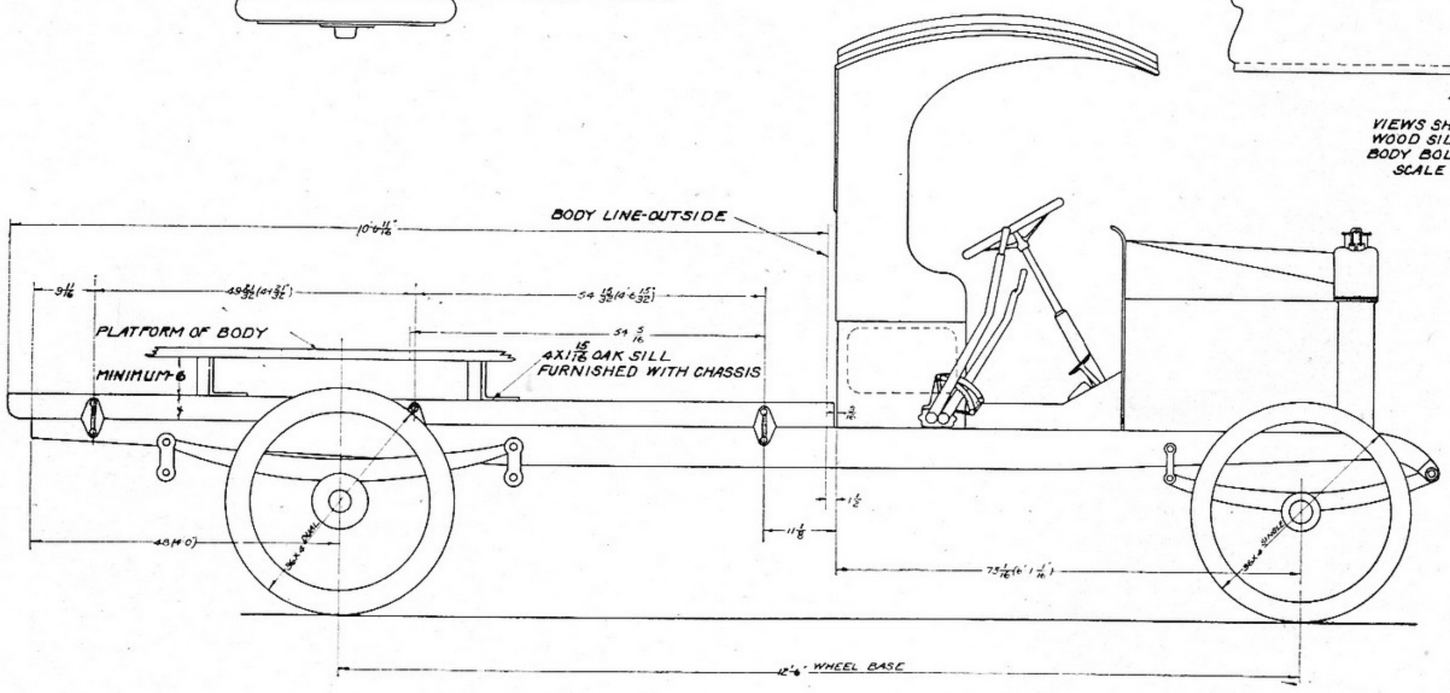
Total admissible load on 2-ton chassis—5,500 pounds. On 5-ton chassis—12,500 pounds.

Note—The above load figures both body and paying load.

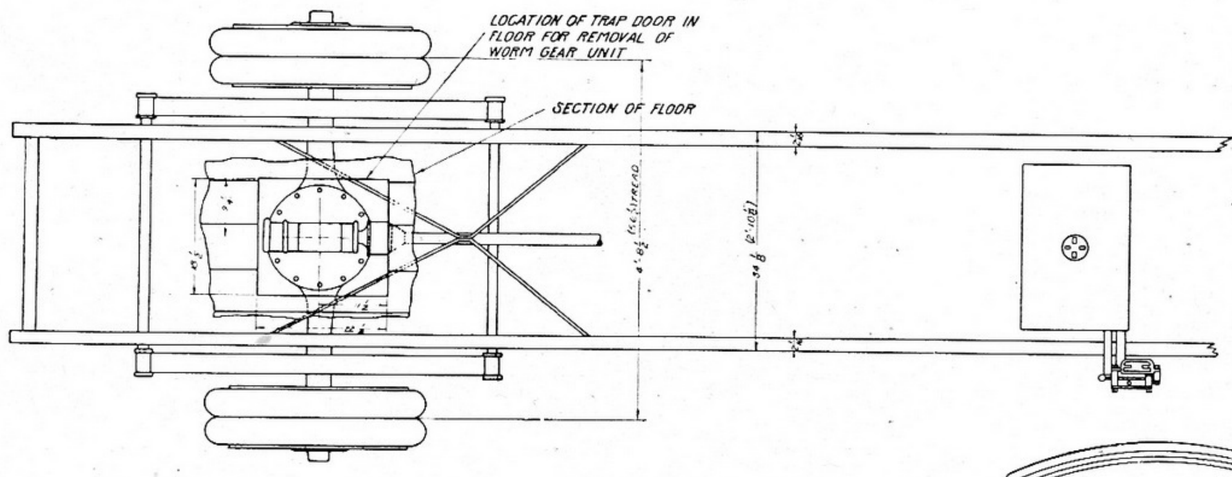


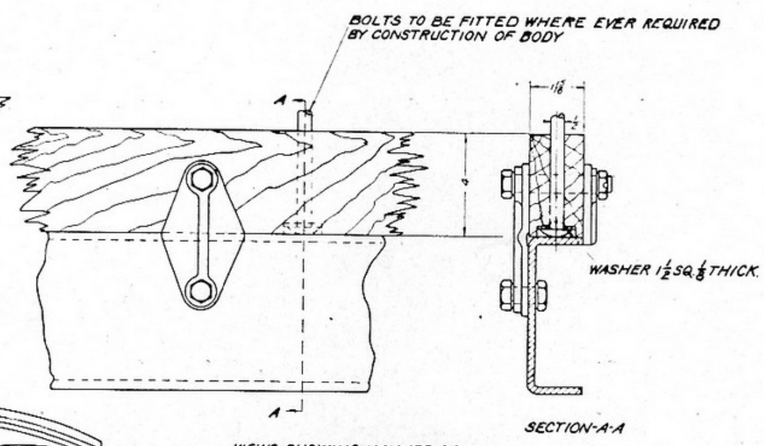


VIEWS SHOWING MANNER OF FASTENING WOOD SILL TO FRAME
BODY BOLTS SUPPLIED BY BODY BUILDERS
SCALE 6"=1'

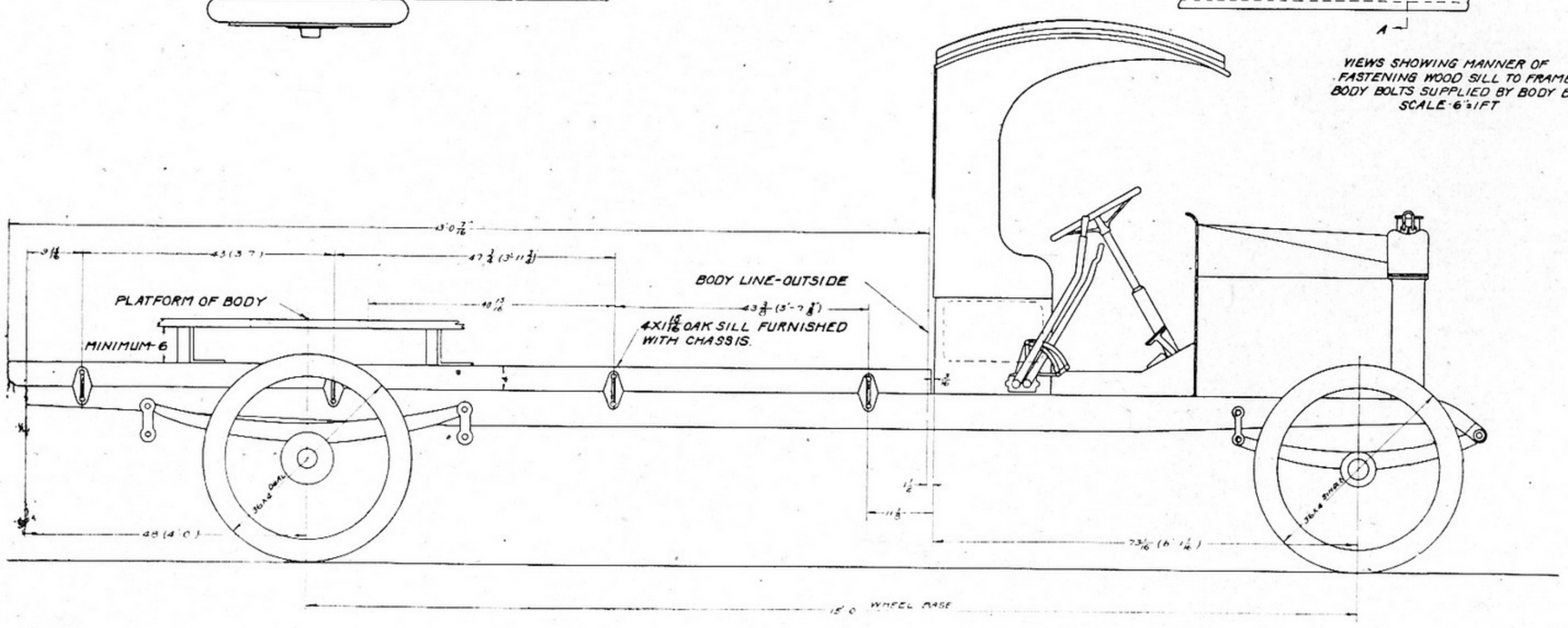


STANDARD 12′ 6″ CHASSIS





VIEWS SHOWING MANNER OF FASTENING WOOD SILL TO FRAME
BODY BOLTS SUPPLIED BY BODY BUILDERS
SCALE 6"=1FT



STANDARD 15′ 0″ CHASSIS

BODY BUILDER'S PLANS

These cuts give the necessary dimensions for the installation of bodies on chassis. It is advisable however, to consult the factory and obtain large scale blue prints.

Standard Warranty

Adopted December 3, 1913, by the National Automobile Chamber of Commerce, Inc.

EACH new motor vehicle manufactured by us, whether passenger car or commercial vehicle, to be free from defects in material and workmanship under normal use and service, our obligation under this warranty being limited to making good at our factory any part or parts thereof which shall, within ninety (90) days after delivery of such vehicle to the original purchaser, be returned to us with transportation charges prepaid, and which our examination shall disclose to our satisfaction to have been thus defective; this warranty being expressly in lieu of all other warranties expressed or implied and of all other obligations or liabilities on our part, and we neither assume nor authorize any other person to assume for us any other liability in connection with the sale of our vehicles.

This warranty shall not apply to any vehicle which shall have been repaired or altered outside of our factory in any way so as, in our judgment, to affect its stability or reliability, nor which has been subject to misuse, negligence or accident, nor to any commercial vehicle made by us which shall have been operated at a speed exceeding the factory rated speed, or loaded beyond the factory rated load capacity.

We make no warranty whatever in respect to tires, rims, ignition apparatus, horns or other signaling devices, starting devices, generators, batteries, speedometers or other trade accessories, inasmuch as they are usually warranted separately by their respective manufacturers.

THE PIERCE-ARROW MOTOR CAR COMPANY,
BUFFALO, N. Y.

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